AIR POLLUTION CHARACTERIZATION AND CONTROL, LTD.

VOC EMISSIONS TESTING
TWO CMM CATALYTIC OXIDIZERS
BAXTER HEALTHCARE CORP.
MOUNTAIN HOME, ARKANSAS
JULY 2016

AR DEQ Permit 0544-AR-12
AFIN 03-00002

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APCC Project 16020

APCC AIR POLLUTION CHARACTERIZATION AND CONTROL, LTD.

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1.0 INTRODUCTION

Air Pollution Characterization and Control, Ltd. (APCC) was retained by the CMM Group of DePere, Wisconsin; to perform a VOC destruction efficiency (DE) test program on two new CMM Recuperative Catalytic Oxidizers at Baxter Healthcare Corporation (Baxter) in Mountain Home, Arkansas. The oxidizers were installed in 2015 to control emissions of ethylene oxide (EtO; CAS 75-21-8). This test program was performed to satisfy the requirements of the following:

- **AR DEQ Permit 0544-AR-12; AFIN 03-00002**
- **40 CFR 63 Subpart O; *Ethylene Oxide Emissions Standards for Sterilization Facilities***

Baxter produces health care products at the Mountain Home facility. These products require sterilization using EtO upon the conclusion of manufacture and packaging. Following sterilization in sterilization chambers (not subject to this test program), these products are placed in aeration chambers to out-gas the remainder of the EtO following the final sterilizer drawdowns. CMM installed these two 25,000 cfm catalytic oxidizers to control emissions of EtO from four aeration chambers. Each oxidizer controls emissions from two aeration chambers.

Testing was performed to demonstrate compliance with the required VOC destruction efficiency of $\geq$99% or emission concentration of $\leq$1 ppm as EtO, as per 40 CFR 63 Subpart O, as well as the Arkansas DEQ Permit.

Sampling of the two catalytic oxidizers was performed utilizing EPA Methods 1, 2, 18 and 25A under normal plant operating conditions to determine destruction efficiency for VOC as Non-Methane Hydrocarbons (NMHC). EtO emissions from the oxidizer were determined as described below.

Total Hydrocarbon (THC) emissions were determined at the inlet of each catalytic oxidizer in accordance with EPA Method 25A. This measurement is a quantification of all volatile hydrocarbon (up to approximately C_{17}) emissions expressed in relation to an instrument calibration as methane.

Concentrations of methane and non-methane hydrocarbons, a better measure of VOC, were determined at the catalytic oxidizer outlet only during each test by Method 18 and 25A. Typical inlet methane concentrations are ambient and <1% of total THC (typical ambient CH_4 is ~1-2 ppm) and were not quantified.

Volumetric flow rates were be measured at both sample locations during each test in accordance with EPA Methods 1 and 2. Data were utilized to determine mass emission rates and catalytic oxidizer destruction efficiency.

Testing was conducted on Monday and Tuesday; 25 and 26 July 2016. Testing was performed under the supervision of Brett T. Smith, Principal Engineer of APCC, assisted on-site by Derrek Schultz, Environmental Scientist. Darren Reschke of CMM was on-site to oversee catalytic oxidizer operations. Process and regulatory coordination was provided by Kurt Parnell, of Baxter Healthcare. No regulatory personnel were on-site during the test program.

The results of this test program are discussed in Section 2. A facility description and details of the operational conditions of the facility during testing are presented in Section 3. An in depth description of all sampling and analytical methodologies to be utilized during testing is presented in Section 4. Section 5 contains APCC's quality assurance/quality control (QA/QC) plan as implemented during the performance of the test program.

2.0 RESULTS & DISCUSSION

APCC performed destruction efficiency of the recuperative catalytic oxidizers used to control EtO being emitted from the aeration chambers at Baxter Healthcare's facility in Mountain Home, Arkansas.

Testing was performed on 25 and 26 July 2016 under normal operations. Process operational data are presented in Appendix C.

Triplicate 60-minute tests were performed at the inlet and outlet of each oxidizer.

Test results for testing performed on 25 July on Oxidizer B are presented in Table 2-1.

Test results for testing performed on 26 July on Oxidizer A are presented in Table 2-2.

Measurements at both oxidizers indicate compliance with permit conditions, under the compliance scenario limiting emissions of ethylene oxide to ≤1.0 ppm. An EtO FID response factor of 1.3, with respect to methane, was utilized to determine concentrations of EtO measured as methane. Using this response factor, 1 ppm CH_4 equals 0.77 ppm EtO; or 1 ppm EtO will be equivalent to 1.3 ppm CH_4.

Essentially all measured hydrocarbons exiting both oxidizers was quantified as methane, a non-VOC. These data indicate compliance with the alternate emission requirement of ≤1 ppm EtO.

It should be noted that EtO loading to the oxidizers was significantly less than design conditions as described in Section 3. It is likely that at higher loadings to these units, destruction efficiency would be higher as oxidizers tend to perform at a greater efficiency at higher VOC loadings.

All sampling and analyses were performed in accordance with 40 CFR 60 Appendix A Methods 1, 2, 3, 18, and 25A, as described in Section 4 of this report. All tests met the QA/QC requirements of the above methodologies.

All field sampling, analytical, calibration and process data are presented in the Appendix of this report.

Table 2-1

Summary of Measured Destruction Efficiency
Oxidizer B
Baxter Healthcare
Mountain Home, Arkansas
25-Jul-16

Test No.	Time	Inlet Flow (scfm)	Inlet THC (ppm as CH_4)	Inlet THC (lbs/hr as CH4)	Outlet Flow (scfm)	Outlet THC (ppm as CH_4)	Outlet CH_4 (ppm)	Outlet NMHC (ppm as CH_4)	Outlet NMHC (lbs/hr as CH_4)	Destruction Efficiency (%)
1	1103-1203	24,068	33.9	2.03	23,863	5.9	5.1	0.8	0.05	97.5%
2	1218-1318	23,842	25.1	1.49	24,846	5.6	5.0	0.6	0.04	97.6%
3	1338-1438	23,937	40.4	2.41	27,344	5.8	4.8	1.0	0.07	97.1%
Average		23,949	33.1	1.98	25,351	5.8	4.9	0.8	0.05	97.4%

Table 2-2

Summary of Measured Destruction Efficiency
Oxidizer A
Baxter Healthcare
Mountain Home, Arkansas
26-Jul-16

		Inlet			Outlet					Destruction
Test No.	**Time**	Flow (scfm)	THC (ppm as CH_4)	THC (lbs/hr as CH4)	Flow (scfm)	THC (ppm as CH_4)	CH_4 (ppm)	NMHC (ppm as CH_4)	NMHC (lbs/hr as CH_4)	**Efficiency** (%)
1	830-930	24,458	26.2	1.60	25,835	7.8	8.0	<0.1	<0.01	**>99.6%**
2	944-1044	24,384	15.1	0.92	25,923	7.0	7.5	<0.1	<0.01	**>99.3%**
3	1100-1200	24,760	15.3	0.95	25,727	7.0	7.2	<0.1	<0.01	**>99.3%**
Average		24,534	18.9	1.15	25,828	7.3	7.5	<0.1	<0.01	**>99.4%**

3.0 PROCESS DESCRIPTION

Baxter produces health care products at the Mountain Home facility. These products require sterilization using EtO upon the conclusion of manufacture and packaging. Products are placed in a sterilization chamber, which is evacuated with vacuum pumps. The chamber is then flooded with ethylene oxide.

After a predetermined time, the chamber is evacuated, removing approximately 95% of the EtO by vacuum pumps, which exhaust to a scrubber where it is converted to ethylene glycol. Following sterilization in the sterilization chambers (not subject to this test program), these products are placed in aeration chambers to out-gas the remainder of the EtO following the sterilizer drawdowns.

Each of the four aeration chambers is nominally 96,000 ft^3 in volume (when empty). Approximately 67,000 lbs. of product is placed in each of these chambers over a period of 24 hours, and allowed to out-gas for an additional period of 100 hours. Aeration chamber exhaust is vented to the air pollution controls described below. Chambers 401 and 402 exhaust to Oxidizer A, while Chambers 501 and 502 exhaust to Oxidizer B (see figure in Appendix). Each aeration chamber exhaust is approximately 12,000-13,000 acfm at 115°F, exhausting at maximum of 8.5 lbs/hr EtO to each oxidizer.

In 2015, CMM installed two new 25,000 cfm recuperative catalytic oxidizers to control emissions of EtO from the aeration chambers. Each oxidizer utilizes a forced draft fan to provide aeration chamber exhaust to a 2,850 kg Clariant catalyst, with a minimum catalyst inlet temperature of 350°F. Both oxidizers are fired with natural gas.

The Recuperative Catalytic oxidizer is designed to operate transparent to the production facility. Exhaust emissions from the aeration chambers are collected in a common ductwork header and directed to the recuperative catalytic oxidizer using the main recuperative catalytic oxidizer supply fan. Volumetric control through the oxidizer is automatically adjusted by using a variable frequency drive unit to control the fan speed by sensing and monitoring collection ductwork pressure. The exhaust flow volume from the process is expected to fluctuate and also to contain various levels of VOC loading.

The process exhaust air is forced into the inlet of the catalytic oxidizer and is directed through the "cold" side of the primary heat exchanger to be preheated. The preheated air then enters into the burner chamber (typically at a temperature very close to the temperature required for oxidation) where it is heated further to the final set point temperature (350°F for EtO).

The heated air stream then passes through the catalyst. 2,850 kg Clariant catalyst is used to achieve the required VOC destruction efficiency. VOC destruction takes place in the catalyst, where the VOC is destroyed at a rated DE ≥99%.

The clean (hot) air then passes from the catalyst through the "hot" side of the primary heat exchanger. In the heat exchanger, energy from the hot gas is used to preheat the incoming exhaust stream with no cross contamination. The clean (cooled) air is then routed through the secondary heat exchanger to pre-heat make-up air for the sterilization rooms.

After passing through this heat exchanger, exhaust vents to the atmosphere through the 35' tall, 34" diameter exhaust stack. A schematic of the recuperative catalytic oxidizer is presented in Figure 2-1.

3.1 Sample Locations

Sample was drawn from four sample ports at the inlet of each catalytic oxidizer, and two sampling ports located 90° apart located on each exhaust stack.

The inlet sampling port locations are located in each 24x48-inch inlet duct >256" (>8.0 Eq. diameters) downstream and 40" (1.25 Eq. diameters) upstream from any flow disturbances. In accordance with EPA Method 1, 16 traverse points were used for flow measurements performed during each emissions test.

The outlet sampling port locations are located in the 34-inch exhaust stack. This location is 2.3 diameters downstream and 6.7 diameters upstream from any flow disturbances, therefore, 12 traverse points chosen in accordance with Method 1 were used to perform flow measurements during each emissions test.

Figures 3-2 and 3-3 present photos of the inlet and outlet sample locations, respectively.

3.2 Process Operations

During the test program, the aeration chambers were in continuous rotational operation, with the majority of aeration chambers in each of the four rooms filled during the test period. Logs showing chamber utilization during the test period are presented in Appendix C. Chambers with an Availability Date and Time subsequent to the test program time were active at the time of testing.

The catalytic oxidizers operated within 90% of rated capacity of 25,000 acfm exhausting both aeration rooms on that particular trunk. Catalyst inlet temperature was maintained at ≥360°F for Oxidizer A and ≥350°F for oxidizer B. Catalyst inlet temperature data is presented in Appendix C.

Figure 3-1 – Recuperative Catalytic Oxidizer

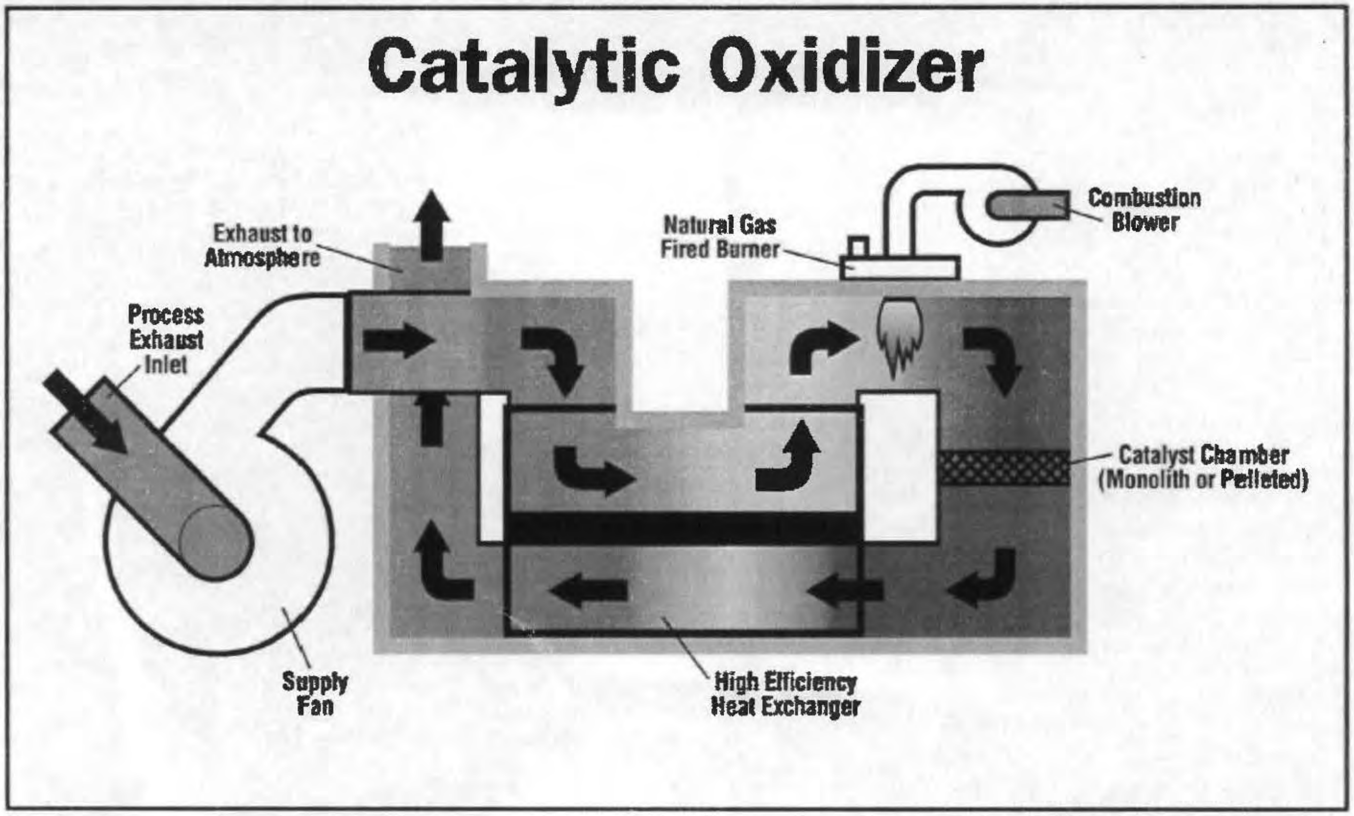


Figure 3-2 – Catalytic Oxidizer Inlet Sample Location

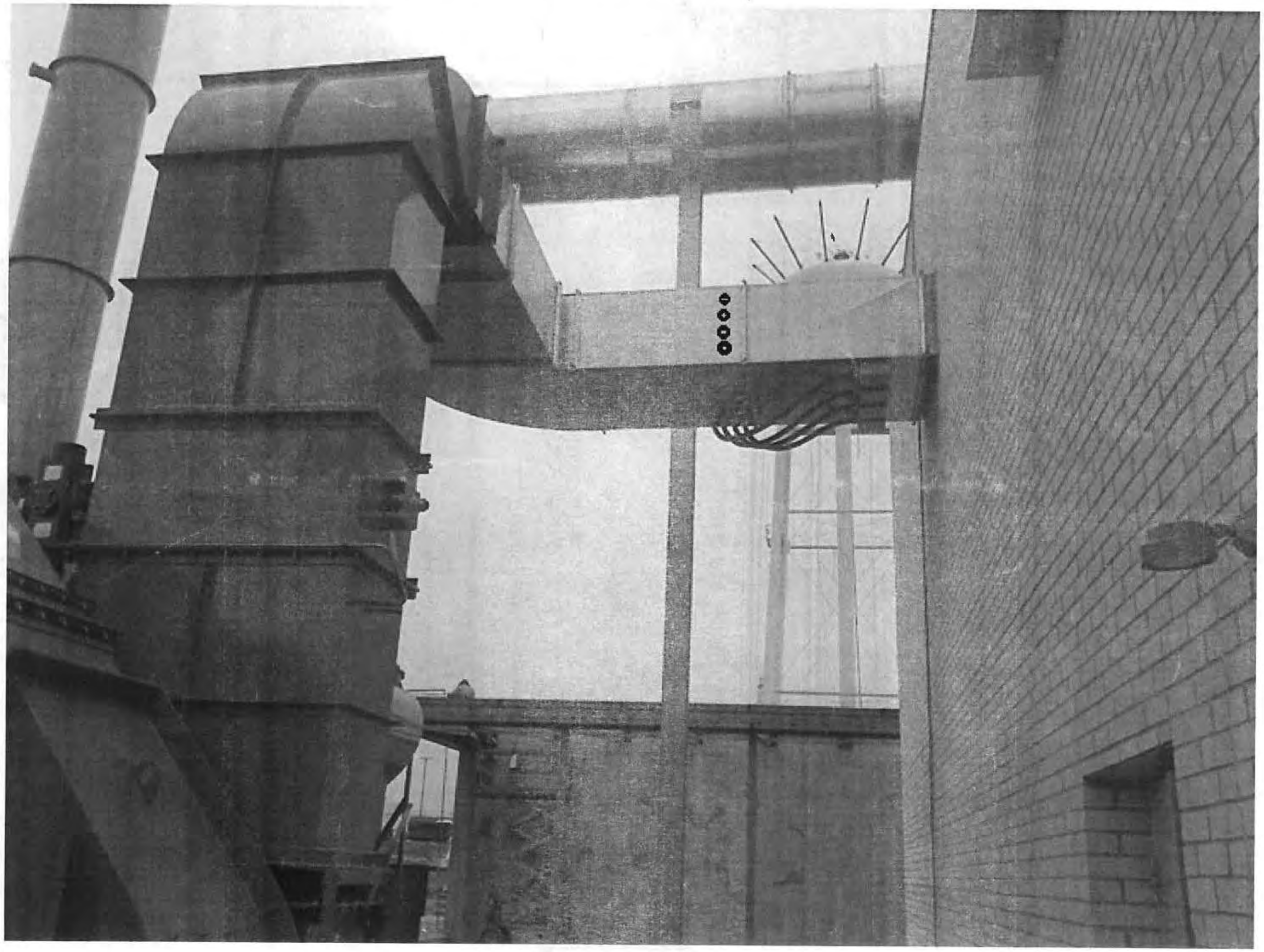
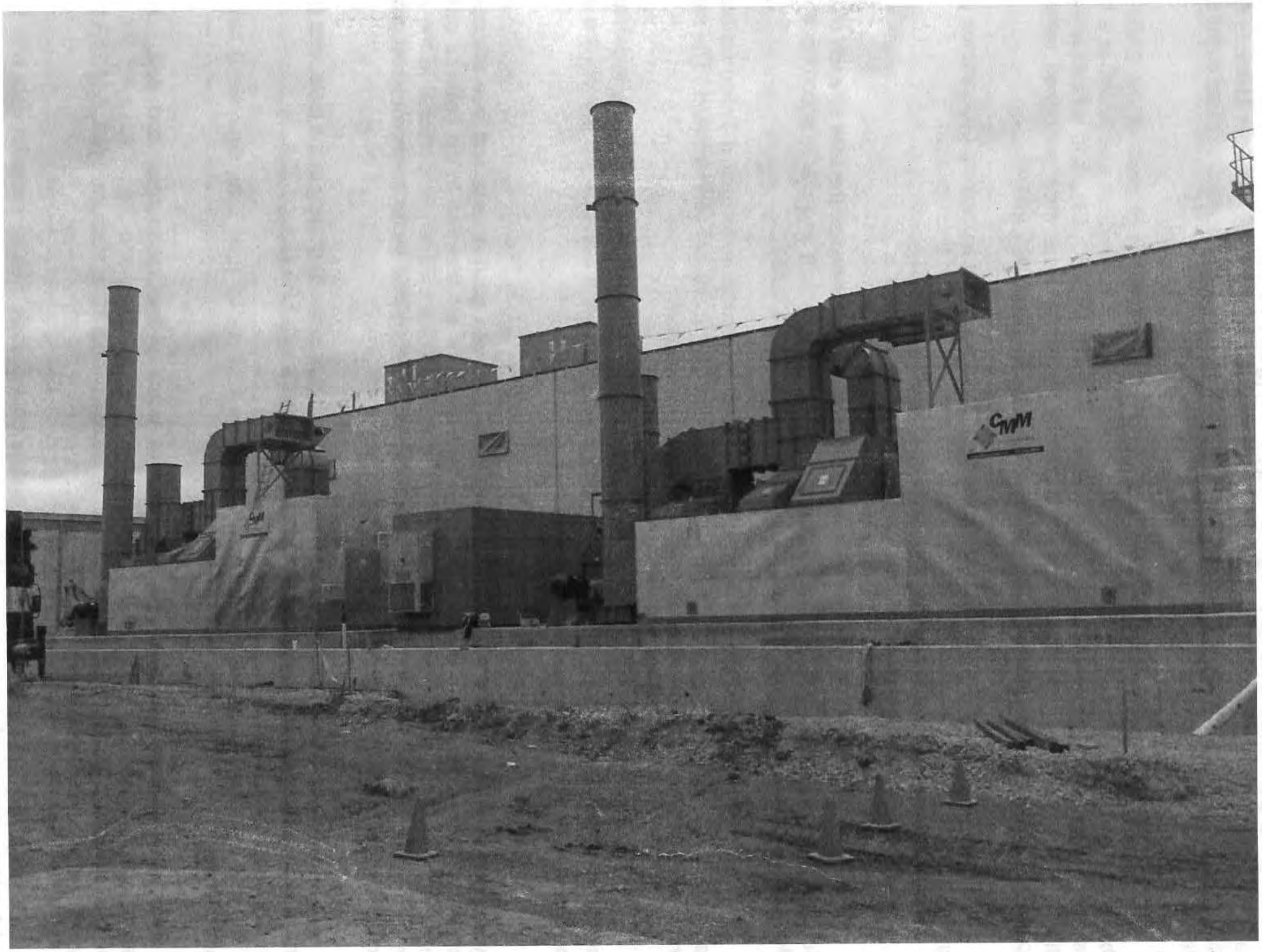


Figure 3-3 – Catalytic Oxidizer Outlet Sampling Location



4.0 SAMPLING AND ANALYTICAL METHODOLOGY

APCC performed a volatile organic compound (VOC) control efficiency (DE) test program on each of the two CMM Catalytic Oxidizers described above in accordance with EPA Methods 1, 2, 18 & 25A. Non-Methane Hydrocarbons (NMHC) concentration was analyzed at each oxidizer outlet in order to yield a non-methane hydrocarbon VOC (actual) control efficiency.

Sample was drawn from the inlet and outlet (simultaneously) of each of the CMM Catalytic Oxidizers through heated (320°F nominal) Teflon sample lines. One oxidizer was tested at a time. Inlet gas was sampled for THC only, while the outlet was sampled for THC, CH_4, and subsequently NMHC, utilizing instrumentation described below. Triplicate 60-minute tests were performed under normal operating conditions at the inlet and outlet of each of the CMM Catalytic Oxidizers.

The IRM system is housed in one of APCC's Environmental Monitoring Laboratories (EML). A single sampling point in the centroid of the duct was used for testing at each location.

4.1 Instrument Reference Method Monitoring – VOC/THC

Instrument Reference Method (IRM) Monitoring was performed at the inlet of each of the CMM Catalytic Oxidizers using a VIG 20/2 (or equivalent) total hydrocarbon analyzer in accordance with EPA Method 25A. Data was recorded using an ESC 8816 digital data logger.

Stack gas is drawn through a stainless steel probe connected to heated Teflon calibration and sample lines. The sample lines are heated to 320°F (nominal) to prevent condensation. The sample line enters APCC's EML and is directly connected to the THC analyzer.

The analyzer utilizes a Flame Ionization Detector (FID) to measure, as carbon, hydrocarbons C_1 through C_{18}; and is calibrated as CH_4. Approximately 2.0 lpm are drawn from the sample line and enter the heated detector bench, which contains the FID.

Flame ionization is a process of continuously creating ions by flame, whereby, upon combustion, hydrocarbon molecules and carbon atoms are separated into positive ions and free electrons. The positive ions are attracted to the burner (-); the free electrons are attracted to the collector cylinder (+). An electron flow is established from the burner to the collector cylinder, proportional to the ionization created by the flame. The resulting current is detected and amplified by an electrometer/amplifier circuit and deflects an analog meter display.

THC analyzers are calibrated and leak checked prior to the beginning of the tests, and calibration and drift checks are performed between tests in accordance with EPA Method 25A.

The analyzer was calibrated on a 0-300 ppm CH_4 (0-100 ppm C_3H_8 equivalent) range at the oxidizer inlet.

THC analyzer performance is defined in terms of calibration error and drift. Multi-point calibrations are performed to establish linearity prior to sampling and then throughout the program. Quality assurance objectives are defined by EPA and shall be met for each valid run. A M-25A calibration data sheet is presented in the Appendix.

An ESC 8816 digital data logger is used to continuously monitor emission data with 10-second and 1-minute integrated averages recorded.

4.2 Non-Methane Hydrocarbons

A VIG 200 THC/Methane/Non-Methane Hydrocarbon Analyzer, which utilizes dual flame ionization detectors (FID) for THC and CH_4/NMHC; and a chromatographic column (CH_4/NMHC); was used to determine THC, methane and non-methane hydrocarbon (NMHC) concentrations (measured as CH_4) at the oxidizer outlet. Approximately 2 lpm of gas is drawn from the exhaust duct through a Teflon sample line heated to 320°F (nominal). The sample gas is drawn through a heated filter and valve by a heated pump. The sample gas then enters the heated detector bench, which contains the column and dual FIDs.

One fraction of the sample is continuously introduced to the FID for THC analyses. A second portion of the sample gas is injected onto the GC column at approximately 3-minute intervals. The column has an interior coating that separates organic compounds primarily by size (i.e. molecular weight) and boiling point. Methane is essentially a non-retained compound that elutes from the column first, and is then directed to the FID for analyses.

Following the elution of the methane, the flow through the column is reversed (back-flushed) and all non-methane constituents are flushed out and directed to the FID. The resulting current is detected and amplified by an electrometer/amplifier circuit. The output of the amplifier provides two usable signals to the recorder, for near real-time continuous monitoring of THC & CH4. Total hydrocarbon emissions are determined along with the methane component, with the resultant arithmetic difference being NMHC, which were utilized for DE calculation.

Calibrations were performed utilizing methane/propane mixed standards on a 0-30 ppm CH_4 and 0-60 ppm THC as CH_4. Three standard concentrations and a zero N_2 were utilized.

4.3 Stack Gas Flow Rate

APCC determined volumetric flow rates of the effluent at the inlet and outlet sampling locations during each test described above in accordance with EPA Methods 1 and 2 using an S-type pitot and inclined manometer. The stack temperature is monitored by a thermocouple connected to a potentiometer.

Stack gas molecular weight was determined in accordance with EPA Method 3 calculations utilizing ambient concentrations of O_2 and CO_2. In addition, stack gas moisture content was determined utilizing psychrometric measurements (wet/dry bulb). These measurements, however, are not used to calculate mass emission rates, as all measurements of emission concentration are performed on a hot/wet basis.

4.4 Emission Rate Calculations

Non-methane hydrocarbon (NMHC) concentration was determined utilizing sixty 1-minute average THC concentration measurements as CH_4 at the oxidizer inlet as well as corresponding calculated NMHC as CH_4 at the outlet in accordance with methods described above. Mass emission rates were determined as CH_4, utilizing a molecular weight of 16 g/g-mole, in accordance with the following equation:

$$\mathbf{MER} = \frac{\mathbf{ppm \times mw}}{\mathbf{385.1\ E6}} \times \mathbf{Q} \times \mathbf{60}$$

Where: MER = Mass Emission Rate (lbs/hr)
ppm = Concentration of NMHC
mw = molecular weight of CH_4 (16)

Q = Volumetric Flow rate (scfm)
385.1 E6 = constant for units conversion taking into account mole volume, metric to English, STP, etc.

Destruction Efficiency (DE) was determined in accordance with the following equation:

$$\%DE = \frac{\textbf{MER (inlet) - MER (outlet)}}{\textbf{MER (inlet)}} \times 100$$

An EtO FID response factor of 1.3, with respect to methane, was utilized to determine concentrations of EtO measured as methane. Using this response factor, 1 ppm CH_4 equals 0.77 ppm EtO; or 1 ppm EtO is equivalent to 1.3 ppm CH_4. These data were utilized to determine compliance with the alternate emission requirement of <1 ppm EtO.

5.0 QUALITY ASSURANCE

The project manager is responsible for implementation of the quality assurance program as applied to the project.

5.1 Sampling Quality Assurance

Generally, implementation of quality assurance procedures for source measurement programs is designed so that the work is done:

1. By competent, trained individuals experienced in the specific methodologies being used.

2. Using properly calibrated equipment.

3. Using approved procedures for sample handling and documentation.

Measurement devices, pitot tubes, dry gas meters, thermocouples and portable gas analyzers are uniquely identified and calibrated with documented procedures and acceptance criteria before and after each field effort. Records of all calibration data are maintained in the files.

Data are recorded on standard forms. Bound field notebooks are used to record observations and miscellaneous elements affecting data, calculations, or evaluation.

Prior to the test program APCC provides the following, as applicable:

1. Filter numbers and tare weights of all filters available for the test.

2. The results of reagent blank runs on the reagents to be used during the test.

3. Calibrations of all pitot tubes, dry gas meters, orifice meters, sampling nozzles, and thermocouples used during the test. All calibrations are performed within four months prior to the test date.

Specific details of APCC's QA program for stationary air pollution sources may be found in "Quality Assurance Handbook for Air Pollution Measurement Systems", Volume III (EPA-600/4-7-027b).

In addition to the test samples, blank samples of each collection media (reagents and filters) are collected at the test site for background analyses. All blank samples are analyzed in conjunction with actual test samples. Sampling results are corrected for these backgrounds if required.

Appropriate sample recovery data are recorded on the sample identification and handling logs, chain of custody forms and analytical data forms.

Recovered samples are stored in shock-proof containers for storage and shipment for analyses.

5.2 Analytical Quality Control

APCC maintains a vigorous quality control program for all samples analyzed. This program is based on the general guidelines given in "Handbook for Analytical Quality Control in Water and Wastewater Laboratories" (EPA-600/4-79-019; March 1979). This program suggests guidelines in the areas of:

- Laboratory services
- Instrument selection

- Glassware
- Reagents
- Solvents
- Gases
- Analytical performance
- Data handling and reporting
- Water and wastewater sampling
- Laboratory safety

APCC has made additions to the EPA program which include the following:

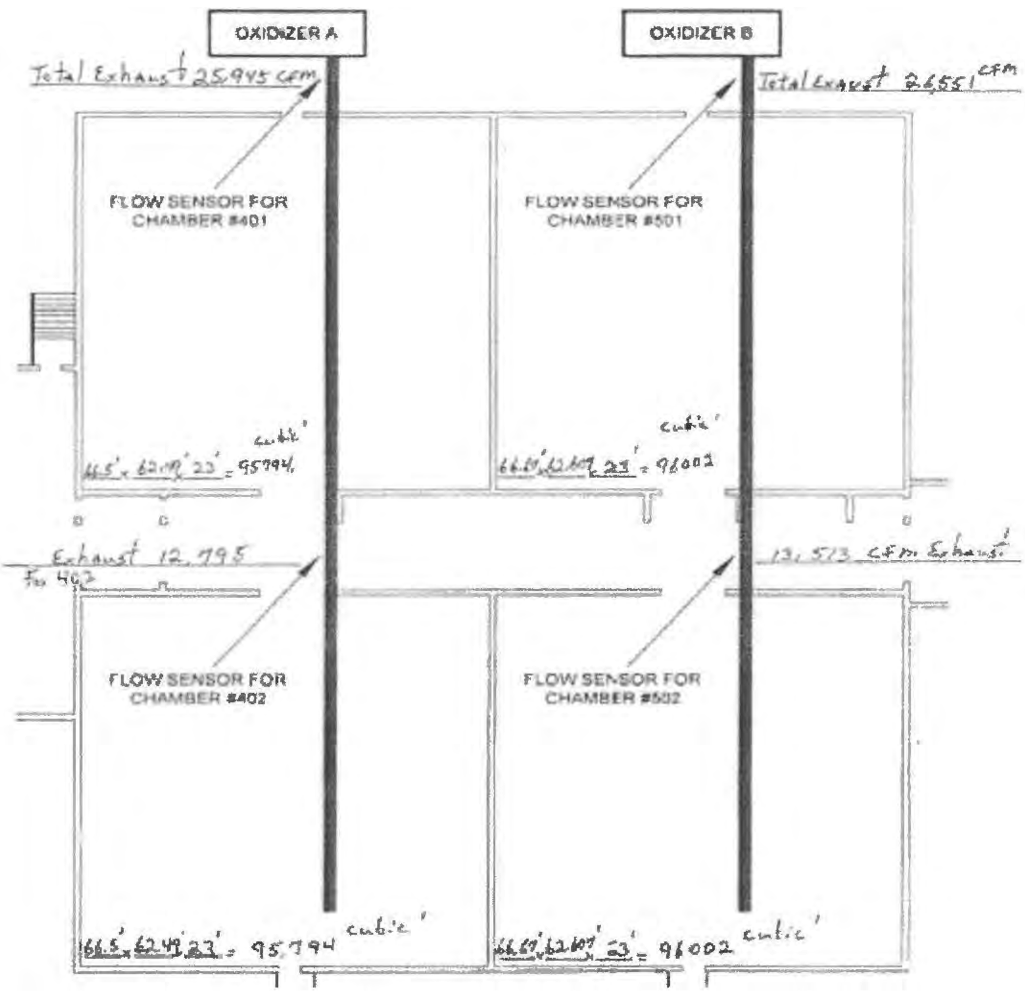
1. Triplicate analysis for each parameter on 10 percent of samples.
2. Ten percent of the samples are spiked by the laboratory manager with known amounts of the parameter of interest and re-analyzed to determine the percent recovery. A Shewhart control chart is used for the percent recovery control (EPA Handbook of Analytical Quality Control in Water and Wastewater Laboratories, 1979).
3. Standards and curves are determined for each analysis using the appropriate standard. Least squares linear regressions calculations are used in determining the "best fit" to the data. Correlation coefficients are also calculated.

5.3 Data Validation

Validation of data is performed by the Program Manager against the QA/QC criteria of the specific methods. The data are assessed for quality and accuracy as required to meet the objectives of the test program. Sample calculations are performed with raw data separate from the reported calculations and results. All documentation is checked for correctness, completeness and verified as checked.

An assessment of sampling results is performed by the Program Manager. The data assessment is performed during scheduled time periods to ensure quality data was collected and processed. Corrective action is implemented, as warranted, to ensure QA/QC procedures were met.

APPENDIX


OXIDIZER A
OXIDIZER B
Total Exhaust 25,945 cfm
Total Exhaust 26,551 cfm
FLOW SENSOR FOR CHAMBER #401
FLOW SENSOR FOR CHAMBER #501
66.5' x 62.49' x 23' = 95794 cubic'
= 96002 cubic'
Exhaust 12,795
For 402
13,513 cfm Exhaust
FLOW SENSOR FOR CHAMBER #402
FLOW SENSOR FOR CHAMBER #502
66.5' x 62.49' x 23' = 95,794 cubic'
23' = 96002 cubic'

$$\text{Lbs/hr} = \frac{\text{Lbs}}{\text{DSCF}} * \text{DSCFM} * 60$$

$$\text{Lbs/DSCF} = \frac{\text{ppm} * \text{Mw}}{385.1 * 10^6}$$

$$\text{Lbs/MMBtu} = \text{Lb/DSCF} * F_d * \frac{20.9}{20.9 - O_2}$$

10. Lbs/hr by Heat Input

lbs/hr = lbs/MMBtu / (MMBtu/hr heat input)

Where:

Cp = Pitot Coefficient, (0.84 S-Type, 0.99 Standard)
Ts = Stack Temp. (°F)
As = Stack Area, (sq. ft.)
Y = Module Calib. Factor
Vi = Volume H2O Impingers, (ml.)
Vsg = Volume H2O Silica Gel
T = Time, (minutes)
Dn = Nozzle Diameter, (inches)
Vm = Meter Volume, (cubic feet)
Mw = Molecular Weight of Stack Gas, (lb / lb mole)
Pb = Barometric Pressure, (in. Hg)
DSCF = Dry Standard Cubic Feet
Mg = Milligrams
F_d = Fuel Factor (O_2 Dry)
Ps = Absolute Pressure in Stack (Pb + (P_{static} / 13.6))
n = Number of Data Points
t0.975 = t-value from Table 2-1, 40 CFR 60 App. B, Spec. 2
|d| = Absolute Value of Mean of Difference Between CEMS and IRM System
|CC| = Absolute Value of Confidence Coefficient
RM = Reference Method Value
RA = Relative Accuracy of CEMS

Sample Calculations

1.Duct Velocity (FPM)

$$Vs = 5129.4 \times Cp \times SQRT\Delta P \text{ avg.} \times SQRT(Ts / (Ps \times Mw))$$ ($\Delta P \times \cos Ø$ if applic.)

2.Duct Volumetric Flowrate (ACFM)

$$Qa = Vs \times As$$

3.Duct Volumetric Flowrate (DSCFM)

$$Qstd = Qa \times \frac{528}{(Ts + 460)} \times \frac{Ps}{29.92} \times [1 - (\%H_2O/100)]$$

4.Meter Volume corrected to Standard Conditions (DSCF)

$$Vm(std) = Vm \times \gamma \times \frac{528}{(Tm+460)} \times \frac{Pb + (\Delta H / 13.6)}{29.92}$$

5.Moisture Content of Stack Gas

$$\%H_2O = \frac{.04707\ (Vi + Vsg)}{Vm(std) + .04707\ (Vi + Vsg)}$$

6.Isokinetic Factor

$$\%\ Iso = \frac{5.67\ (Ts + 460)\ (Vm\ std)}{(Pb + (Ps/13.6)\ Vs\ T\ (1 - (\%H20) / 100)\ ((Dn^2 \times 0.7854) / 144)}$$

7.Module Sampling Rate

$$\Delta H = \Delta P \frac{[846.72\ D_n\ \Delta H\ @\ C_p\ (1-\%H_2O)^2\ Md\ Tm\ Ps]}{Ms\ Ts\ Pb}$$

8.Stack Concentration

$$ppm = \frac{mg}{m^3} \cdot \frac{24.06}{Mw}$$

$$ppm = \frac{Lbs/DSCF * (385.1 * 10^6}{Mw}$$

9. Pollutant Emission Rate

$$Lbs/hr = ppm * SCFM * Mw * (15.58 * 10^{-8)}$$

APPENDIX A
Data Summaries

APCC AIR POLLUTION CHARACTERIZATION AND CONTROL, LTD.

Test 1

EPA Method 2

Velocity Travers
Flow Rate Determ

Firm	Baxter Healthcare			
Date	25-Jul-16	Project No.	16020	
Location	Oxidizer B Inlet			

Round Stack or Duct:

Diameter (in) ____ Area ____ ft^2

Rectangular Stack or Duct:

Stack Length (in) 48 Area 8.00 ft^2

Stack Width (in) 24

Barometric Pressure; Pb = 29.50 in. Hg

Stack Static Pressure; Pg = -2.90 in. H2O

Stack Gas Moisture Content; % H2O = 1.00% O_2: 20.9

Stack Gas Molecular Weight; (wet) Mw = 28.85 CO_2: 0.1

Pitot Tube No. P-48-2 Cp = 0.84 Cyclonic Flow Angle: + Ø Clockwise

Field Tester(s) DES - Ø Counterwise

Test Start Time: 1104 Finish: 1113

PORT	POINT	ΔP (Inch H2O)	√ΔP	Ts (°F)	± Ø	Pitots Reversed ?	RADIANS	√ΔP*cosØ
1	1	0.57	.7550	113	0°		.0000	.7550
	2	0.85	.9220	115	0°		.0000	.9220
	3	1.10	1.0488	116	0°		.0000	1.0488
	4	1.00	1.0000	116	0°		.0000	1.0000
2	1	0.55	.7416	116	0°		.0000	.7416
	2	0.92	.9592	116	0°		.0000	.9592
	3	1.10	1.0488	116	0°		.0000	1.0488
	4	1.10	1.0488	116	0°		.0000	1.0488
3	1	0.56	.7483	116	0°		.0000	.7483
	2	1.00	1.0000	116	0°		.0000	1.0000
	3	1.20	1.0954	116	0°		.0000	1.0954
	4	1.10	1.0488	116	0°		.0000	1.0488
4	1	0.58	.7616	116	0°		.0000	.7616
	2	0.86	.9274	116	0°		.0000	.9274
	3	1.00	1.0000	116	0°		.0000	1.0000
	4	0.95	.9747	116	0°		.0000	.9747
		AVERAGE	.9425	116°F			AVERAGE	.9425

Absolute Gas Temperature; Tst = Ts + 460°	576	° R
Absolute Gas Pressure; Ps = Pb + Pg/13.6	29.29	in. Hg
Gas Velocity; Vs = (85.49)Cp(√ΔP*cosØ)avg√(Tst avg/(Ps*Mw))	56	ft/sec
Actual Gas Flow Rate; Qa = (Vs)(60)(A)	26824	acfm
Standard Gas Flow Rate; Qs = Qa(528°R/Tst)(Ps/29.92)	24068	scfm
Dry Standard Gas Flow Rate; Qsd = Qa(528°R/Tst)(Ps/29.92)((100-%H2O)/1(	23828	dscfm

APCC AIR POLLUTION CHARACTERIZATION AND CONTROL, LTD.

APCC AIR POLLUTION CHARACTERIZATION AND CONTROL, LTD.

EPA Method 2

Velocity Traverse and Flow Rate Determinatio

Firm: Baxter Healthcare
Date: 25-Jul-16 Project No. 16020
Location: Oxidizer B Outlet

Round Stack or Duct:
Diameter (in) 34 Area 6.30 ft^2

Rectangular Stack or Duct:
Stack Length (in) Area ft^2
Stack Width (in)

Barometric Pressure; Pb = 29.50 in. Hg
Stack Static Pressure; Pg = -0.48 in. H2O
Stack Gas Moisture Content; % H2O = 1.00% O_2: 20.9
Stack Gas Molecular Weight; (wet) Mw = 28.85 CO_2: 0.1
Pitot Tube No. P-11 Cp = 0.84 Cyclonic Flow Angle: + Ø Clockwise
Field Tester(s) DES - Ø Counterwise
Test Start Time: 1119 Finish: 1127

PORT	POINT	ΔP (Inch H2O)	√ΔP	Ts (°F)	± Ø	Pitots Reversed ?	RADIANS	√ΔP*cosØ
1	1	1.10	1.0488	118	0°		.0000	1.0488
	2	1.30	1.1402	120	0°		.0000	1.1402
	3	1.30	1.1402	121	0°		.0000	1.1402
	4	1.50	1.2247	121	0°		.0000	1.2247
	5	1.40	1.1832	122	0°		.0000	1.1832
	6	1.40	1.1832	122	0°		.0000	1.1832
	7	1.30	1.1402	122	0°		.0000	1.1402
	8	1.30	1.1402	122	0°		.0000	1.1402
2	1	1.60	1.2649	121	0°		.0000	1.2649
	2	1.50	1.2247	122	0°		.0000	1.2247
	3	1.50	1.2247	122	0°		.0000	1.2247
	4	1.50	1.2247	122	0°		.0000	1.2247
	5	1.50	1.2247	122	0°		.0000	1.2247
	6	1.60	1.2649	122	0°		.0000	1.2649
	7	1.40	1.1832	122	0°		.0000	1.1832
	8	1.40	1.1832	122	0°		.0000	1.1832
		AVERAGE	**1.1872**	**121°F**			**AVERAGE**	**1.1872**

Absolute Gas Temperature; Tst = Ts + 460°	**581**	**° R**
Absolute Gas Pressure; Ps = Pb + Pg/13.6	**29.46**	**in. Hg**
Gas Velocity; Vs = (85.49)Cp(√ΔP*cosØ)avg√(Tst avg/(Ps*Mw))	**70**	**ft/sec**
Actual Gas Flow Rate; Qa = (Vs)(60)(A)	**26664**	**acfm**
Standard Gas Flow Rate; Qs = Qa(528°R/Tst)(Ps/29.92)	**23863**	**scfm**
Dry Standard Gas Flow Rate; Qsd = Qa(528°R/Tst)(Ps/29.92)((100-%H2O)/1(	**23624**	**dscfm**

APCC AIR POLLUTION CHARACTERIZATION AND CONTROL, LTD.

Test 2

EPA Method 2

Velocity Travers
Flow Rate Determ

Firm	Baxter Healthcare		
Date	25-Jul-16	Project No.	16020
Location	Oxidizer B Inlet		

Round Stack or Duct:

Diameter (in) ______ Area ______ ft^2

Rectangular Stack or Duct:

Stack Length (in) 48 Area 8.00 ft^2

Stack Width (in) 24

Barometric Pressure; Pb = 29.50 in. Hg

Stack Static Pressure; Pg = -2.90 in. H2O

Stack Gas Moisture Content; % H2O = 1.00% O_2: 20.9

Stack Gas Molecular Weight; (wet) Mw = 28.85 CO_2: 0.1

Pitot Tube No. P-48-2 Cp = 0.84 Cyclonic Flow Angle: + Ø Clockwise

Field Tester(s) DES - Ø Counterwise

Test Start Time: 1218 Finish: 1227

PORT	POINT	ΔP (Inch H2O)	√ΔP	Ts (°F)	± Ø	Pitots Reversed ?	RADIANS	√ΔP*cosØ
1	1	0.52	.7211	116	0°		.0000	.7211
	2	0.82	.9055	116	0°		.0000	.9055
	3	1.00	1.0000	116	0°		.0000	1.0000
	4	0.97	.9849	116	0°		.0000	.9849
2	1	0.54	.7348	116	0°		.0000	.7348
	2	0.93	.9644	116	0°		.0000	.9644
	3	1.10	1.0488	116	0°		.0000	1.0488
	4	1.00	1.0000	116	0°		.0000	1.0000
3	1	0.54	.7348	116	0°		.0000	.7348
	2	1.00	1.0000	116	0°		.0000	1.0000
	3	1.20	1.0954	116	0°		.0000	1.0954
	4	1.10	1.0488	116	0°		.0000	1.0488
4	1	0.50	.7071	116	0°		.0000	.7071
	2	0.93	.9644	116	0°		.0000	.9644
	3	1.10	1.0488	116	0°		.0000	1.0488
	4	0.96	.9798	116	0°		.0000	.9798
		AVERAGE	.9337	116°F			AVERAGE	.9337

Absolute Gas Temperature; Tst = Ts + 460°	576	° R
Absolute Gas Pressure; Ps = Pb + Pg/13.6	29.29	in. Hg
Gas Velocity; Vs = (85.49)Cp(√ΔP*cosØ)avg√(Tst avg/(Ps*Mw))	55	ft/sec
Actual Gas Flow Rate; Qa = (Vs)(60)(A)	26572	acfm
Standard Gas Flow Rate; Qs = Qa(528°R/Tst)(Ps/29.92)	23842	scfm
Dry Standard Gas Flow Rate; Qsd = Qa(528°R/Tst)(Ps/29.92)((100-%H2O)/1(	23604	dscfm

APCC AIR POLLUTION CHARACTERIZATION AND CONTROL, LTD.

APCC AIR POLLUTION CHARACTERIZATION AND CONTROL, LTD.

EPA Method 2

Velocity Travers
Flow Rate Determ

Firm: Baxter Healthcare
Date: 25-Jul-16 Project No. 16020
Location: Oxidizer B Outlet

Round Stack or Duct:
Diameter (in) 34 Area 6.30 ft^2

Rectangular Stack or Duct:
Stack Length (in) ____ Area ____ ft^2
Stack Width (in) ____

Barometric Pressure; Pb = 29.50 in. Hg
Stack Static Pressure; Pg = -0.48 in. H2O
Stack Gas Moisture Content; % H2O = 1.00% O_2: 20.9
Stack Gas Molecular Weight; (wet) Mw = 28.85 CO_2: 0.1
Pitot Tube No. P-11 Cp = 0.84 Cyclonic Flow Angle: + Ø Clockwise
Field Tester(s) DES - Ø Counterwise
Test Start Time: 1230 Finish: 1241

PORT	POINT	ΔP (Inch H2O)	√ΔP	Ts (°F)	± Ø	Pitots Reversed ?	RADIANS	√ΔP*cosØ
1	1	1.40	1.1832	124	0°		.0000	1.1832
	2	1.50	1.2247	126	0°		.0000	1.2247
	3	1.50	1.2247	126	0°		.0000	1.2247
	4	1.60	1.2649	126	0°		.0000	1.2649
	5	1.60	1.2649	126	0°		.0000	1.2649
	6	1.70	1.3038	126	0°		.0000	1.3038
	7	1.70	1.3038	126	0°		.0000	1.3038
	8	1.20	1.0954	126	0°		.0000	1.0954
2	1	1.60	1.2649	125	0°		.0000	1.2649
	2	1.70	1.3038	126	0°		.0000	1.3038
	3	1.50	1.2247	126	0°		.0000	1.2247
	4	1.50	1.2247	126	0°		.0000	1.2247
	5	1.50	1.2247	126	0°		.0000	1.2247
	6	1.60	1.2649	126	0°		.0000	1.2649
	7	1.60	1.2649	126	0°		.0000	1.2649
	8	1.50	1.2247	126	0°		.0000	1.2247
		AVERAGE	1.2415	126°F			AVERAGE	1.2415

Absolute Gas Temperature; Tst = Ts + 460°	586	° R
Absolute Gas Pressure; Ps = Pb + Pg/13.6	29.46	in. Hg
Gas Velocity; Vs = (85.49)Cp(√ΔP*cosØ)avg√(Tst avg/(Ps*Mw))	74	ft/sec
Actual Gas Flow Rate; Qa = (Vs)(60)(A)	28001	acfm
Standard Gas Flow Rate; Qs = Qa(528°R/Tst)(Ps/29.92)	24846	scfm
Dry Standard Gas Flow Rate; Qsd = Qa(528°R/Tst)(Ps/29.92)((100-%H2O)/1(	24597	dscfm

Test 3

EPA Method 2

Velocity Traverse and Flow Rate Determinatio

Firm: Baxter Healthcare
Date: 25-Jul-16 Project No. 16020
Location: Oxidizer B Inlet

Round Stack or Duct:
Diameter (in) ______ Area ______ ft^2

Rectangular Stack or Duct:
Stack Length (in) 48 Area 8.00 ft^2
Stack Width (in) 24
Barometric Pressure; Pb = 29.50 in. Hg
Stack Static Pressure; Pg = -2.90 in. H2O
Stack Gas Moisture Content; % H2O = 1.00% O_2: 20.9
Stack Gas Molecular Weight; (wet) Mw = 28.85 CO_2: 0.1
Pitot Tube No. P-48-2 Cp = 0.84 Cyclonic Flow Angle: + Ø Clockwise
Field Tester(s) DES - Ø Counterwise
Test Start Time: 1339 Finish: 1344

PORT	POINT	ΔP (Inch H2O)	√ΔP	Ts (°F)	± Ø	Pitots Reversed ?	RADIANS	√ΔP*cosØ
1	1	0.51	.7141	116	0°		.0000	.7141
	2	0.85	.9220	116	0°		.0000	.9220
	3	1.10	1.0488	116	0°		.0000	1.0488
	4	1.00	1.0000	116	0°		.0000	1.0000
2	1	0.58	.7616	116	0°		.0000	.7616
	2	0.93	.9644	116	0°		.0000	.9644
	3	1.10	1.0488	116	0°		.0000	1.0488
	4	1.10	1.0488	116	0°		.0000	1.0488
3	1	0.57	.7550	116	0°		.0000	.7550
	2	0.98	.9899	116	0°		.0000	.9899
	3	1.20	1.0954	116	0°		.0000	1.0954
	4	1.10	1.0488	117	0°		.0000	1.0488
4	1	0.54	.7348	116	0°		.0000	.7348
	2	0.83	.9110	116	0°		.0000	.9110
	3	0.95	.9747	116	0°		.0000	.9747
	4	0.96	.9798	116	0°		.0000	.9798
		AVERAGE	**.9374**	**116°F**			**AVERAGE**	**.9374**

Absolute Gas Temperature; Tst = Ts + 460°	**576**	**° R**
Absolute Gas Pressure; Ps = Pb + Pg/13.6	**29.29**	**in. Hg**
Gas Velocity; Vs = (85.49)Cp(√ΔP*cosØ)avg√(Tst avg/(Ps*Mw))	**56**	**ft/sec**
Actual Gas Flow Rate; Qa = (Vs)(60)(A)	**26678**	**acfm**
Standard Gas Flow Rate; Qs = Qa(528°R/Tst)(Ps/29.92)	**23937**	**scfm**
Dry Standard Gas Flow Rate; Qsd = Qa(528°R/Tst)(Ps/29.92)((100-%H2O)/1(	**23697**	**dscfm**

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APCC AIR POLLUTION CHARACTERIZATION AND CONTROL, LTD.

EPA Method 2

Velocity Traverse and Flow Rate Determinatio

Firm: Baxter Healthcare
Date: 25-Jul-16 Project No. 16020
Location: Oxidizer B Outlet

Round Stack or Duct:
Diameter (in) 34 Area 6.30 ft^2

Rectangular Stack or Duct:
Stack Length (in) ____ Area ____ ft^2
Stack Width (in) ____

Barometric Pressure; Pb = 29.50 in. Hg
Stack Static Pressure; Pg = -0.68 in. H2O
Stack Gas Moisture Content; % H2O = 1.00% O_2: 20.9
Stack Gas Molecular Weight; (wet) Mw = 28.85 CO_2: 0.1
Pitot Tube No. P-11 Cp = 0.84 Cyclonic Flow Angle: + Ø Clockwise
Field Tester(s) DES - Ø Counterwise
Test Start Time: 1348 Finish: 1357

PORT	POINT	ΔP (Inch H2O)	√ΔP	Ts (°F)	± Ø	Pitots Reversed ?	RADIANS	√ΔP*cosØ
1	1	10.00	3.1623	129	0°		.0000	3.1623
	2	1.40	1.1832	129	0°		.0000	1.1832
	3	1.50	1.2247	129	0°		.0000	1.2247
	4	1.40	1.1832	130	0°		.0000	1.1832
	5	1.60	1.2649	131	0°		.0000	1.2649
	6	1.60	1.2649	131	0°		.0000	1.2649
	7	1.60	1.2649	131	0°		.0000	1.2649
	8	1.30	1.1402	131	0°		.0000	1.1402
2	1	1.80	1.3416	130	0°		.0000	1.3416
	2	1.70	1.3038	130	0°		.0000	1.3038
	3	1.70	1.3038	130	0°		.0000	1.3038
	4	1.50	1.2247	131	0°		.0000	1.2247
	5	1.50	1.2247	131	0°		.0000	1.2247
	6	1.60	1.2649	131	0°		.0000	1.2649
	7	1.80	1.3416	132	0°		.0000	1.3416
	8	1.60	1.2649	132	0°		.0000	1.2649
		AVERAGE	1.3724	131°F			AVERAGE	1.3724

Absolute Gas Temperature; Tst = Ts + 460°	591	° R
Absolute Gas Pressure; Ps = Pb + Pg/13.6	29.45	in. Hg
Gas Velocity; Vs = (85.49)Cp(√ΔP*cosØ)avg√(Tst avg/(Ps*Mw))	82	ft/sec
Actual Gas Flow Rate; Qa = (Vs)(60)(A)	31095	acfm
Standard Gas Flow Rate; Qs = Qa(528°R/Tst)(Ps/29.92)	27344	scfm
Dry Standard Gas Flow Rate; Qsd = Qa(528°R/Tst)(Ps/29.92)((100-%H2O)/1(	27070	dscfm

APCC AIR POLLUTION CHARACTERIZATION AND CONTROL, LTD.

Test 1

EPA Method 2

Velocity Travers
Flow Rate Determ

Firm: Baxter Healthcare
Date: 26-Jul-16 Project No. 16020
Location: Oxidizer A Inlet

Round Stack or Duct:
Diameter (in) ______ Area ______ ft^2

Rectangular Stack or Duct:
Stack Length (in) 48 Area 8.00 ft^2
Stack Width (in) 24
Barometric Pressure; Pb = 29.50 in. Hg
Stack Static Pressure; Pg = -2.80 in. H2O
Stack Gas Moisture Content; % H2O = 1.00% O_2: 20.9
Stack Gas Molecular Weight; (wet) Mw = 28.85 CO_2: 0.1
Pitot Tube No. P-48-2 Cp = 0.84 Cyclonic Flow Angle: + Ø Clockwise, - Ø Counterwise
Field Tester(s) DES
Test Start Time: 831 Finish: 839

PORT	POINT	ΔP (Inch H2O)	√ΔP	Ts (°F)	± Ø	Pitots Reversed ?	RADIANS	√ΔP*cosØ
1	1	0.66	.8124	114	0°		.0000	.8124
	2	1.00	1.0000	114	0°		.0000	1.0000
	3	1.10	1.0488	115	0°		.0000	1.0488
	4	1.00	1.0000	115	0°		.0000	1.0000
2	1	0.68	.8246	115	0°		.0000	.8246
	2	1.00	1.0000	115	0°		.0000	1.0000
	3	1.10	1.0488	115	0°		.0000	1.0488
	4	1.10	1.0488	116	0°		.0000	1.0488
3	1	0.65	.8062	115	0°		.0000	.8062
	2	1.00	1.0000	116	0°		.0000	1.0000
	3	1.20	1.0954	116	0°		.0000	1.0954
	4	1.00	1.0000	116	0°		.0000	1.0000
4	1	0.56	.7483	115	0°		.0000	.7483
	2	0.88	.9381	115	0°		.0000	.9381
	3	1.00	1.0000	115	0°		.0000	1.0000
	4	0.88	.9381	115	0°		.0000	.9381
		AVERAGE	.9569	115°F			AVERAGE	.9569

Absolute Gas Temperature; Tst = Ts + 460° 575 °R
Absolute Gas Pressure; Ps = Pb + Pg/13.6 29.29 in. Hg
Gas Velocity; Vs = (85.49)Cp(√ΔP*cosØ)avg√(Tst avg/(Ps*Mw)) 57 ft/sec
Actual Gas Flow Rate; Qa = (Vs)(60)(A) 27205 acfm
Standard Gas Flow Rate; Qs = Qa(528°R/Tst)(Ps/29.92) 24458 scfm
Dry Standard Gas Flow Rate; Qsd = Qa(528°R/Tst)(Ps/29.92)((100-%H2O)/1(24214 dscfm

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EPA Method 2

Velocity Traverse and Flow Rate Determinatio

Firm	Baxter Healthcare		
Date	26-Jul-16	Project No.	16020
Location	Oxidizer A Outlet		

Round Stack or Duct:

Diameter (in) 34 Area 6.30 ft^2

Rectangular Stack or Duct:

Stack Length (in) ______ Area ______ ft^2

Stack Width (in) ______

Barometric Pressure; Pb = 29.50 in. Hg

Stack Static Pressure; Pg = -0.64 in. H2O

Stack Gas Moisture Content; % H2O = 1.00% O_2: 20.9

Stack Gas Molecular Weight; (wet) Mw = 28.85 CO_2: 0.1

Pitot Tube No. P-11 Cp = 0.84 Cyclonic Flow Angle: + Ø Clockwise

Field Tester(s) DES - Ø Counterwise

Test Start Time: 842 Finish: 853

PORT	POINT	ΔP (Inch H2O)	√ΔP	Ts (°F)	± Ø	Pitots Reversed ?	RADIANS	√ΔP*cosØ
1	1	1.70	1.3038	118	0°		.0000	1.3038
	2	1.80	1.3416	118	0°		.0000	1.3416
	3	1.70	1.3038	119	0°		.0000	1.3038
	4	1.70	1.3038	119	0°		.0000	1.3038
	5	1.60	1.2649	119	0°		.0000	1.2649
	6	1.70	1.3038	119	0°		.0000	1.3038
	7	1.50	1.2247	119	0°		.0000	1.2247
	8	1.40	1.1832	119	0°		.0000	1.1832
2	1	1.60	1.2649	119	0°		.0000	1.2649
	2	1.70	1.3038	119	0°		.0000	1.3038
	3	1.70	1.3038	119	0°		.0000	1.3038
	4	1.70	1.3038	119	0°		.0000	1.3038
	5	1.90	1.3784	120	0°		.0000	1.3784
	6	1.80	1.3416	121	0°		.0000	1.3416
	7	1.50	1.2247	121	0°		.0000	1.2247
	8	1.40	1.1832	121	0°		.0000	1.1832
		AVERAGE	1.2834	119°F			AVERAGE	1.2834

Absolute Gas Temperature; Tst = Ts + 460°	579	° R
Absolute Gas Pressure; Ps = Pb + Pg/13.6	29.45	in. Hg
Gas Velocity; Vs = (85.49)Cp(√ΔP*cosØ)avg√(Tst avg/(Ps*Mw))	76	ft/sec
Actual Gas Flow Rate; Qa = (Vs)(60)(A)	28780	acfm
Standard Gas Flow Rate; Qs = Qa(528°R/Tst)(Ps/29.92)	25835	scfm
Dry Standard Gas Flow Rate; Qsd = Qa(528°R/Tst)(Ps/29.92)((100-%H2O)/1(	25577	dscfm

APCC AIR POLLUTION CHARACTERIZATION AND CONTROL, LTD.

Test 2

EPA Method 2

Velocity Travers
Flow Rate Determ

APCC AIR POLLUTION CHARACTERIZATION AND CONTROL, LTD.

Firm Baxter Healthcare
Date 26-Jul-16 Project No. 16020
Location Oxidizer A Inlet

Round Stack or Duct:
Diameter (in) ____ Area ____ ft^2

Rectangular Stack or Duct:
Stack Length (in) 48 Area 8.00 ft^2
Stack Width (in) 24
Barometric Pressure; Pb = 29.50 in. Hg
Stack Static Pressure; Pg = -2.60 in. H2O
Stack Gas Moisture Content; % H2O = 1.00% O_2: 20.9
Stack Gas Molecular Weight; (wet) Mw = 28.85 CO_2: 0.1
Pitot Tube No. P-48-2 Cp = 0.84 Cyclonic Flow Angle: + Ø Clockwise
Field Tester(s) DES - Ø Counterwise
Test Start Time: 944 Finish: 951

PORT	POINT	ΔP (Inch H2O)	√ΔP	Ts (°F)	± Ø	Pitots Reversed ?	RADIANS	√ΔP*cosØ
1	1	0.64	.8000	116	0°		.0000	.8000
	2	0.89	.9434	116	0°		.0000	.9434
	3	1.00	1.0000	116	0°		.0000	1.0000
	4	0.97	.9849	116	0°		.0000	.9849
2	1	0.68	.8246	116	0°		.0000	.8246
	2	1.00	1.0000	116	0°		.0000	1.0000
	3	1.20	1.0954	116	0°		.0000	1.0954
	4	1.00	1.0000	116	0°		.0000	1.0000
3	1	0.72	.8485	116	0°		.0000	.8485
	2	1.10	1.0488	116	0°		.0000	1.0488
	3	1.20	1.0954	116	0°		.0000	1.0954
	4	1.10	1.0488	116	0°		.0000	1.0488
4	1	0.53	.7280	116	0°		.0000	.7280
	2	0.85	.9220	116	0°		.0000	.9220
	3	1.00	1.0000	116	0°		.0000	1.0000
	4	0.87	.9327	116	0°		.0000	.9327
		AVERAGE	.9545	116°F			AVERAGE	.9545

Absolute Gas Temperature; Tst = Ts + 460°	576	° R
Absolute Gas Pressure; Ps = Pb + Pg/13.6	29.31	in. Hg
Gas Velocity; Vs = (85.49)Cp(√ΔP*cosØ)avg√(Tst avg/(Ps*Mw))	57	ft/sec
Actual Gas Flow Rate; Qa = (Vs)(60)(A)	27156	acfm
Standard Gas Flow Rate; Qs = Qa(528°R/Tst)(Ps/29.92)	24384	scfm
Dry Standard Gas Flow Rate; Qsd = Qa(528°R/Tst)(Ps/29.92)((100-%H2O)/1(	24140	dscfm

APCC AIR POLLUTION CHARACTERIZATION AND CONTROL, LTD.

APCC AIR POLLUTION CHARACTERIZATION AND CONTROL, LTD.

EPA Method 2

Velocity Travers
Flow Rate Determ

Firm: Baxter Healthcare
Date: 26-Jul-16 Project No. 16020
Location: Oxidizer A Outlet

Round Stack or Duct:
Diameter (in) 34 Area 6.30 ft^2

Rectangular Stack or Duct:
Stack Length (in) ____ Area ____ ft^2
Stack Width (in) ____

Barometric Pressure; Pb = 29.50 in. Hg
Stack Static Pressure; Pg = -0.64 in. H2O
Stack Gas Moisture Content; % H2O = 1.00% O_2: 20.9
Stack Gas Molecular Weight; (wet) Mw = 28.85 CO_2: 0.1
Pitot Tube No. P-11 Cp = 0.84 Cyclonic Flow Angle: + Ø Clockwise
Field Tester(s) DES - Ø Counterwise
Test Start Time: 954 Finish: 1003

PORT	POINT	ΔP (Inch H2O)	√ΔP	Ts (°F)	± Ø	Pitots Reversed ?	RADIANS	√ΔP*cosØ
1	1	1.40	1.1832	125	0°		.0000	1.1832
	2	1.60	1.2649	125	0°		.0000	1.2649
	3	1.60	1.2649	125	0°		.0000	1.2649
	4	1.70	1.3038	126	0°		.0000	1.3038
	5	1.80	1.3416	126	0°		.0000	1.3416
	6	1.80	1.3416	126	0°		.0000	1.3416
	7	2.00	1.4142	126	0°		.0000	1.4142
	8	1.60	1.2649	126	0°		.0000	1.2649
2	1	1.70	1.3038	125	0°		.0000	1.3038
	2	1.80	1.3416	126	0°		.0000	1.3416
	3	1.80	1.3416	126	0°		.0000	1.3416
	4	1.70	1.3038	126	0°		.0000	1.3038
	5	1.70	1.3038	126	0°		.0000	1.3038
	6	1.60	1.2649	126	0°		.0000	1.2649
	7	1.60	1.2649	126	0°		.0000	1.2649
	8	1.50	1.2247	126	0°		.0000	1.2247
		AVERAGE	1.2955	126°F			AVERAGE	1.2955

Absolute Gas Temperature; Tst = Ts + 460°	586	°R
Absolute Gas Pressure; Ps = Pb + Pg/13.6	29.45	in. Hg
Gas Velocity; Vs = (85.49)Cp(√ΔP*cosØ)avg√(Tst avg/(Ps*Mw))	77	ft/sec
Actual Gas Flow Rate; Qa = (Vs)(60)(A)	29227	acfm
Standard Gas Flow Rate; Qs = Qa(528°R/Tst)(Ps/29.92)	25923	scfm
Dry Standard Gas Flow Rate; Qsd = Qa(528°R/Tst)(Ps/29.92)((100-%H2O)/1(	25664	dscfm

APCC AIR POLLUTION CHARACTERIZATION AND CONTROL, LTD.

Test 3

EPA Method 2

Velocity Traverse and Flow Rate Determinatio

APCC AIR POLLUTION CHARACTERIZATION AND CONTROL, LTD.

Firm: Baxter Healthcare
Date: 26-Jul-16 Project No. 16020
Location: Oxidizer A Inlet

Round Stack or Duct:
Diameter (in) ____ Area ____ ft^2

Rectangular Stack or Duct:
Stack Length (in) 48 Area 8.00 ft^2
Stack Width (in) 24
Barometric Pressure; Pb = 29.50 in. Hg
Stack Static Pressure; Pg = -2.80 in. H2O
Stack Gas Moisture Content; % H2O = 1.00% O_2: 20.9
Stack Gas Molecular Weight; (wet) Mw = 28.85 CO_2: 0.1
Pitot Tube No. P-48-2 Cp = 0.84 Cyclonic Flow Angle: + Ø Clockwise
Field Tester(s) DES - Ø Counterwise
Test Start Time: 1102 Finish: 1108

PORT	POINT	ΔP (Inch H2O)	√ΔP	Ts (°F)	± Ø	Pitots Reversed ?	RADIANS	√ΔP*cosØ
1	1	0.70	.8367	115	0°		.0000	.8367
	2	1.00	1.0000	115	0°		.0000	1.0000
	3	1.10	1.0488	115	0°		.0000	1.0488
	4	0.94	.9695	115	0°		.0000	.9695
2	1	0.69	.8307	115	0°		.0000	.8307
	2	1.10	1.0488	115	0°		.0000	1.0488
	3	1.20	1.0954	115	0°		.0000	1.0954
	4	1.10	1.0488	115	0°		.0000	1.0488
3	1	0.62	.7874	115	0°		.0000	.7874
	2	1.00	1.0000	116	0°		.0000	1.0000
	3	1.20	1.0954	116	0°		.0000	1.0954
	4	1.10	1.0488	116	0°		.0000	1.0488
4	1	0.60	.7746	116	0°		.0000	.7746
	2	0.91	.9539	116	0°		.0000	.9539
	3	1.00	1.0000	116	0°		.0000	1.0000
	4	0.92	.9592	116	0°		.0000	.9592
		AVERAGE	.9686	115°F			AVERAGE	.9686

Absolute Gas Temperature; Tst = Ts + 460°	575	°R
Absolute Gas Pressure; Ps = Pb + Pg/13.6	29.29	in. Hg
Gas Velocity; Vs = (85.49)Cp(√ΔP*cosØ)avg√(Tst avg/(Ps*Mw))	57	ft/sec
Actual Gas Flow Rate; Qa = (Vs)(60)(A)	27540	acfm
Standard Gas Flow Rate; Qs = Qa(528°R/Tst)(Ps/29.92)	24760	scfm
Dry Standard Gas Flow Rate; Qsd = Qa(528°R/Tst)(Ps/29.92)((100-%H2O)/1(	24512	dscfm

APCC AIR POLLUTION CHARACTERIZATION AND CONTROL, LTD.

APCC AIR POLLUTION CHARACTERIZATION AND CONTROL, LTD.

EPA Method 2

Velocity Traverse and Flow Rate Determinatio

Firm		Baxter Healthcare						
Date	26-Jul-16		Project No.	16020				
Location		Oxidizer A Outlet						
Round Stack or Duct:								
Diameter (in)		34	Area	6.30	ft^2			
Rectangular Stack or Duct:								
Stack Length (in)			Area		ft^2			
Stack Width (in)								
Barometric Pressure; Pb =			29.50	in. Hg				
Stack Static Pressure; Pg =			-0.83	in. H2O				
Stack Gas Moisture Content; % H2O =				1.00%			O_2:	20.9
Stack Gas Molecular Weight; (wet) Mw =				28.85			CO_2:	0.1
Pitot Tube No.		P-11	Cp =	0.84	Cyclonic Flow Angle:		+ Ø	Clockwise
Field Tester(s)			DES				- Ø	Counterwise
Test Start Time:		1110	Finish:	1121				

PORT	POINT	ΔP (Inch H2O)	√ΔP	Ts (°F)	± Ø	Pitots Reversed ?	RADIANS	√ΔP*cosØ
1	1	1.50	1.2247	130	0°		.0000	1.2247
	2	1.60	1.2649	131	0°		.0000	1.2649
	3	1.60	1.2649	131	0°		.0000	1.2649
	4	1.70	1.3038	131	0°		.0000	1.3038
	5	1.80	1.3416	131	0°		.0000	1.3416
	6	1.90	1.3784	131	0°		.0000	1.3784
	7	1.80	1.3416	131	0°		.0000	1.3416
	8	1.80	1.3416	131	0°		.0000	1.3416
2	1	1.80	1.3416	129	0°		.0000	1.3416
	2	1.80	1.3416	130	0°		.0000	1.3416
	3	1.80	1.3416	131	0°		.0000	1.3416
	4	1.60	1.2649	130	0°		.0000	1.2649
	5	1.50	1.2247	130	0°		.0000	1.2247
	6	1.70	1.3038	131	0°		.0000	1.3038
	7	1.40	1.1832	129	0°		.0000	1.1832
	8	1.40	1.1832	129	0°		.0000	1.1832
		AVERAGE	**1.2904**	**130°F**			**AVERAGE**	**1.2904**

Absolute Gas Temperature; Tst = Ts + 460°	**590**	**° R**
Absolute Gas Pressure; Ps = Pb + Pg/13.6	**29.44**	**in. Hg**
Gas Velocity; Vs = (85.49)Cp(√ΔP*cosØ)avg√(Tst avg/(Ps*Mw))	**77**	**ft/sec**
Actual Gas Flow Rate; Qa = (Vs)(60)(A)	**29218**	**acfm**
Standard Gas Flow Rate; Qs = Qa(528°R/Tst)(Ps/29.92)	**25727**	**scfm**
Dry Standard Gas Flow Rate; Qsd = Qa(528°R/Tst)(Ps/29.92)((100-%H2O)/1(	**25470**	**dscfm**

APPENDIX B
Field Data

Date / Time	CH4	OUTLET	INLET	Date / Time	CH4	OUTLET	INLET	Date / Time	CH4	OUTLET	INLET
7/25/2016 11:03	5.3	5.6	32	7/25/2016 12:18	5	5.4	23	7/25/2016 13:38	4.7	5.4	30
7/25/2016 11:04	5.3	5.6	34	7/25/2016 12:19	5	5.2	20	7/25/2016 13:39	4.8	5.3	30
7/25/2016 11:05	5.3	5.3	32	7/25/2016 12:20	4.9	5.1	19	7/25/2016 13:40	4.8	5.2	30
7/25/2016 11:06	5.2	6	31	7/25/2016 12:21	4.6	5.2	19	7/25/2016 13:41	4.8	5.1	30
7/25/2016 11:07	5.2	5.9	31	7/25/2016 12:22	4.6	5	18	7/25/2016 13:42	4.8	5	30
7/25/2016 11:08	5.2	5.3	33	7/25/2016 12:23	4.6	5.1	18	7/25/2016 13:43	4.8	5	29
7/25/2016 11:09	5.2	5.9	34	7/25/2016 12:24	4.9	5.2	18	7/25/2016 13:44	4.7	4.9	30
7/25/2016 11:10	5.2	5.9	30	7/25/2016 12:25	4.9	5.1	18	7/25/2016 13:45	4.5	5	29
7/25/2016 11:11	5.1	6	32	7/25/2016 12:26	4.9	5.2	18	7/25/2016 13:46	4.5	5	29
7/25/2016 11:12	5.1	5.5	30	7/25/2016 12:27	5	5.2	18	7/25/2016 13:47	4.4	4.8	29
7/25/2016 11:13	5.1	5.8	33	7/25/2016 12:28	5	5.2	18	7/25/2016 13:48	4.3	4.9	29
7/25/2016 11:14	5.1	6.1	32	7/25/2016 12:29	5	5.2	18	7/25/2016 13:49	4.3	4.9	29
7/25/2016 11:15	5.4	5.9	30	7/25/2016 12:30	4.8	5.1	18	7/25/2016 13:50	4.4	5	28
7/25/2016 11:16	5.4	6	29	7/25/2016 12:31	4.8	5.4	18	7/25/2016 13:51	4.6	5	28
7/25/2016 11:17	5.5	6.7	32	7/25/2016 12:32	4.8	5.3	18	7/25/2016 13:52	4.6	5	28
7/25/2016 11:18	6	7	33	7/25/2016 12:33	4.9	5.1	18	7/25/2016 13:53	4.6	5.1	28
7/25/2016 11:19	6	6.5	30	7/25/2016 12:34	4.9	5.4	18	7/25/2016 13:54	4.7	5.1	28
7/25/2016 11:20	5.9	6.5	30	7/25/2016 12:35	4.9	5.4	18	7/25/2016 13:55	4.7	5.1	28
7/25/2016 11:21	5.4	6.3	31	7/25/2016 12:36	5.3	5.4	18	7/25/2016 13:56	4.7	5.1	28
7/25/2016 11:22	5.4	6.1	32	7/25/2016 12:37	5.3	5.4	18	7/25/2016 13:57	4.8	5.1	28
7/25/2016 11:23	5.3	5.8	31	7/25/2016 12:38	5.2	5.5	18	7/25/2016 13:58	4.8	5.1	29
7/25/2016 11:24	5	5.9	32	7/25/2016 12:39	5	5.5	18	7/25/2016 13:59	4.8	5.1	29
7/25/2016 11:25	5	6.1	29	7/25/2016 12:40	5	5.4	18	7/25/2016 14:00	4.8	5.4	30
7/25/2016 11:26	5	6.1	32	7/25/2016 12:41	4.9	5.3	18	7/25/2016 14:01	4.8	5.4	31
7/25/2016 11:27	5.1	5.3	31	7/25/2016 12:42	4.9	5.5	18	7/25/2016 14:02	4.7	5.2	31
7/25/2016 11:28	5.1	5.3	33	7/25/2016 12:43	4.9	5.6	18	7/25/2016 14:03	4.6	5.6	33
7/25/2016 11:29	5.2	5.2	33	7/25/2016 12:44	4.8	5.4	19	7/25/2016 14:04	4.6	5.6	34
7/25/2016 11:30	5.5	5.5	32	7/25/2016 12:45	4.7	5.7	19	7/25/2016 14:05	4.6	5.4	36
7/25/2016 11:31	5.5	5	32	7/25/2016 12:46	4.7	5.7	20	7/25/2016 14:06	4.6	5.6	37
7/25/2016 11:32	5.5	5.3	34	7/25/2016 12:47	4.7	5.6	21	7/25/2016 14:07	4.6	5.7	37
7/25/2016 11:33	5.4	5.9	37	7/25/2016 12:48	4.8	5.6	22	7/25/2016 14:08	4.7	5.5	38
7/25/2016 11:34	5.4	4.9	35	7/25/2016 12:49	4.8	5.8	23	7/25/2016 14:09	4.9	5.5	42
7/25/2016 11:35	5.4	5.3	35	7/25/2016 12:50	4.8	5.9	24	7/25/2016 14:10	4.9	5.7	41
7/25/2016 11:36	5.4	5.8	36	7/25/2016 12:51	4.9	6	27	7/25/2016 14:11	4.8	5.8	40
7/25/2016 11:37	5.4	5.7	39	7/25/2016 12:52	4.9	5.7	27	7/25/2016 14:12	4.4	5.7	44
7/25/2016 11:38	5.4	5.3	38	7/25/2016 12:53	4.9	6	26	7/25/2016 14:13	4.4	5.8	46
7/25/2016 11:39	5.1	5.5	35	7/25/2016 12:54	4.9	6	28	7/25/2016 14:14	4.5	6.1	44
7/25/2016 11:40	5.1	5.9	36	7/25/2016 12:55	4.9	5.7	30	7/25/2016 14:15	5	6.1	46
7/25/2016 11:41	5.1	5.6	40	7/25/2016 12:56	5	6	28	7/25/2016 14:16	5	5.9	49
7/25/2016 11:42	5	5.5	37	7/25/2016 12:57	5.6	6.1	29	7/25/2016 14:17	5	6.2	50
7/25/2016 11:43	5	5.7	35	7/25/2016 12:58	5.6	5.8	31	7/25/2016 14:18	5.2	6.3	49
7/25/2016 11:44	5.1	6.3	36	7/25/2016 12:59	5.5	5.7	33	7/25/2016 14:19	5.2	6.2	50
7/25/2016 11:45	5.4	5.8	36	7/25/2016 13:00	5.3	5.7	31	7/25/2016 14:20	5.1	6.2	53
7/25/2016 11:46	5.4	5.7	39	7/25/2016 13:01	5.3	5.4	32	7/25/2016 14:21	4.9	6.6	57
7/25/2016 11:47	5.4	6.4	37	7/25/2016 13:02	5.3	5.6	34	7/25/2016 14:22	4.9	6.5	55
7/25/2016 11:48	5.5	6.4	36	7/25/2016 13:03	5.4	5.8	34	7/25/2016 14:23	4.9	6.4	54
7/25/2016 11:49	5.5	5.8	36	7/25/2016 13:04	5.4	5.4	34	7/25/2016 14:24	4.9	7	55
7/25/2016 11:50	5.4	5.9	36	7/25/2016 13:05	5.3	5.5	35	7/25/2016 14:25	4.9	6.9	57
7/25/2016 11:51	5.2	6.5	39	7/25/2016 13:06	5	5.8	35	7/25/2016 14:26	4.9	6.7	57
7/25/2016 11:52	5.2	6.4	36	7/25/2016 13:07	5	5.7	35	7/25/2016 14:27	4.9	6.5	53
7/25/2016 11:53	5.1	6	35	7/25/2016 13:08	5	5.6	35	7/25/2016 14:28	4.9	6.7	55
7/25/2016 11:54	4.5	6.1	35	7/25/2016 13:09	5	5.8	35	7/25/2016 14:29	4.9	7	57
7/25/2016 11:55	4.5	6.7	39	7/25/2016 13:10	5	5.8	34	7/25/2016 14:30	5.1	6.7	58
7/25/2016 11:56	4	6.6	36	7/25/2016 13:11	5	5.6	35	7/25/2016 14:31	5.1	6.7	51
7/25/2016 11:57	1.5	5.9	34	7/25/2016 13:12	5	5.8	38	7/25/2016 14:32	5.1	6.8	56
7/25/2016 11:58	1.5	6.3	34	7/25/2016 13:13	5	6.1	34	7/25/2016 14:33	5.2	7	56
7/25/2016 11:59	2.2	6.9	37	7/25/2016 13:14	5	5.9	32	7/25/2016 14:34	5.2	7.1	52
7/25/2016 12:00	5.4	6.3	35	7/25/2016 13:15	4.8	5.5	37	7/25/2016 14:35	5.1	6.5	51
7/25/2016 12:01	5.4	6.1	32	7/25/2016 13:16	4.8	6.1	38	7/25/2016 14:36	4.5	7	53
7/25/2016 12:02	5.4	6.8	33	7/25/2016 13:17	4.9	6.2	35	7/25/2016 14:37	4.5	7.2	51
Average	5.08	5.923333	33.9	Average	4.983333	5.556667	25.11667	Average	4.773333	5.79	40.41667
Maximum	6	7	40	Maximum	5.6	6.2	38	Maximum	5.2	7.2	58
Minimum	1.5	4.9	29	Minimum	4.6	5	18	Minimum	4.3	4.8	28

Date / Time	CH4	OUTLET	INLET	Date / Time	CH4	OUTLET	INLET	Date / Time	CH4	OUTLET	INLET
7/26/2016 8:30	7.8	7.1	16	7/26/2016 9:44	7.6	6.8	18	7/26/2016 11:00	7.1	7.4	13
7/26/2016 8:31	7.8	7.1	16	7/26/2016 9:45	7.6	6.8	16	7/26/2016 11:01	7.1	7.3	13
7/26/2016 8:32	7.9	7.3	16	7/26/2016 9:46	7.6	6.8	15	7/26/2016 11:02	7.2	7.3	12
7/26/2016 8:33	8.1	7.2	16	7/26/2016 9:47	7.4	6.7	14	7/26/2016 11:03	7.3	7	13
7/26/2016 8:34	8.1	6.9	16	7/26/2016 9:48	7.2	6.8	14	7/26/2016 11:04	7.3	6.8	12
7/26/2016 8:35	8.1	7.2	16	7/26/2016 9:49	7.2	6.7	13	7/26/2016 11:05	7.2	6.9	12
7/26/2016 8:36	8.1	6.9	16	7/26/2016 9:50	7.2	6.7	13	7/26/2016 11:06	7.1	7	13
7/26/2016 8:37	8.1	6.7	16	7/26/2016 9:51	7.3	6.5	13	7/26/2016 11:07	7.1	6.9	13
7/26/2016 8:38	7.9	6.9	16	7/26/2016 9:52	7.3	6.7	13	7/26/2016 11:08	6.9	6.7	12
7/26/2016 8:39	7.6	7	16	7/26/2016 9:53	7.2	6.7	13	7/26/2016 11:09	6.6	6.8	12
7/26/2016 8:40	7.6	7.1	16	7/26/2016 9:54	7.1	6.7	13	7/26/2016 11:10	6.6	6.8	13
7/26/2016 8:41	7.6	6.7	16	7/26/2016 9:55	7.1	6.7	13	7/26/2016 11:11	6.8	6.8	13
7/26/2016 8:42	7.7	7	16	7/26/2016 9:56	7.2	6.7	13	7/26/2016 11:12	7.2	6.7	12
7/26/2016 8:43	7.7	7.2	15	7/26/2016 9:57	7.4	6.7	13	7/26/2016 11:13	7.2	6.9	12
7/26/2016 8:44	7.8	7	15	7/26/2016 9:58	7.4	6.8	12	7/26/2016 11:14	7.3	6.8	12
7/26/2016 8:45	7.9	7	16	7/26/2016 9:59	7.3	6.8	12	7/26/2016 11:15	7.4	6.6	12
7/26/2016 8:46	7.9	7.1	16	7/26/2016 10:00	7.2	6.6	12	7/26/2016 11:16	7.4	6.7	12
7/26/2016 8:47	8	7.6	16	7/26/2016 10:01	7.2	6.7	12	7/26/2016 11:17	7.2	6.8	12
7/26/2016 8:48	8.3	8.1	17	7/26/2016 10:02	7.2	6.8	12	7/26/2016 11:18	7.1	6.6	12
7/26/2016 8:49	8.3	8.1	17	7/26/2016 10:03	7.4	6.7	11	7/26/2016 11:19	7.1	6.4	12
7/26/2016 8:50	8.2	7.9	19	7/26/2016 10:04	7.4	6.7	11	7/26/2016 11:20	7	6.5	11
7/26/2016 8:51	8.2	7.6	20	7/26/2016 10:05	7.4	6.7	11	7/26/2016 11:21	6.9	6.8	12
7/26/2016 8:52	8.2	8.2	21	7/26/2016 10:06	7.4	6.8	11	7/26/2016 11:22	6.9	6.8	12
7/26/2016 8:53	8	7.9	24	7/26/2016 10:07	7.4	6.7	11	7/26/2016 11:23	6.9	6.6	12
7/26/2016 8:54	7.8	7.7	27	7/26/2016 10:08	7.4	6.8	11	7/26/2016 11:24	7	6.7	12
7/26/2016 8:55	7.8	7.8	27	7/26/2016 10:09	7.5	6.8	11	7/26/2016 11:25	7	6.9	12
7/26/2016 8:56	7.8	8	29	7/26/2016 10:10	7.5	6.9	11	7/26/2016 11:26	7.1	6.7	11
7/26/2016 8:57	7.9	7.9	32	7/26/2016 10:11	7.4	6.7	11	7/26/2016 11:27	7.4	6.8	12
7/26/2016 8:58	7.9	7.9	33	7/26/2016 10:12	7.2	6.7	11	7/26/2016 11:28	7.4	7	12
7/26/2016 8:59	8	8	32	7/26/2016 10:13	7.2	6.9	11	7/26/2016 11:29	7.4	6.9	12
7/26/2016 9:00	8.2	7.9	33	7/26/2016 10:14	7.4	6.9	11	7/26/2016 11:30	7.5	6.9	12
7/26/2016 9:01	8.2	7.9	35	7/26/2016 10:15	7.9	7.1	11	7/26/2016 11:31	7.5	7.2	13
7/26/2016 9:02	8.2	7.8	35	7/26/2016 10:16	7.9	6.8	11	7/26/2016 11:32	7.4	6.9	13
7/26/2016 9:03	8.3	8	31	7/26/2016 10:17	7.7	6.9	11	7/26/2016 11:33	7.1	7	13
7/26/2016 9:04	8.3	8	34	7/26/2016 10:18	7.3	7.3	11	7/26/2016 11:34	7.1	7.3	14
7/26/2016 9:05	8.1	7.8	36	7/26/2016 10:19	7.3	7.1	12	7/26/2016 11:35	7.1	7	15
7/26/2016 9:06	7.9	8	36	7/26/2016 10:20	7.2	7.2	13	7/26/2016 11:36	7.2	7	15
7/26/2016 9:07	7.9	8.1	35	7/26/2016 10:21	7.1	7.2	13	7/26/2016 11:37	7.2	7.1	15
7/26/2016 9:08	7.7	7.8	37	7/26/2016 10:22	7.1	7.2	14	7/26/2016 11:38	7.2	7	16
7/26/2016 9:09	7.5	7.8	40	7/26/2016 10:23	7.2	7.4	15	7/26/2016 11:39	7.2	6.9	16
7/26/2016 9:10	7.5	7.9	40	7/26/2016 10:24	7.3	7.2	16	7/26/2016 11:40	7.2	7	17
7/26/2016 9:11	7.6	8.2	37	7/26/2016 10:25	7.3	7.3	16	7/26/2016 11:41	7.2	7.3	16
7/26/2016 9:12	7.9	8.1	37	7/26/2016 10:26	7.4	7.5	16	7/26/2016 11:42	7.3	7.2	17
7/26/2016 9:13	7.9	7.8	41	7/26/2016 10:27	7.5	7.1	18	7/26/2016 11:43	7.3	7.1	18
7/26/2016 9:14	7.9	8	38	7/26/2016 10:28	7.5	7.6	19	7/26/2016 11:44	7.2	7	18
7/26/2016 9:15	8.1	8.1	34	7/26/2016 10:29	7.6	7.3	18	7/26/2016 11:45	7	7.3	18
7/26/2016 9:16	8.1	8.4	35	7/26/2016 10:30	7.9	7.4	19	7/26/2016 11:46	7	7.4	19
7/26/2016 9:17	8	8.2	36	7/26/2016 10:31	7.9	7.4	21	7/26/2016 11:47	7	7.2	20
7/26/2016 9:18	7.8	7.9	32	7/26/2016 10:32	7.9	7.4	22	7/26/2016 11:48	7.2	7.5	20
7/26/2016 9:19	7.8	8	29	7/26/2016 10:33	7.9	7.4	21	7/26/2016 11:49	7.2	7.2	20
7/26/2016 9:20	7.9	8.6	31	7/26/2016 10:34	7.9	7.6	21	7/26/2016 11:50	7.2	7.4	21
7/26/2016 9:21	8.1	8.2	31	7/26/2016 10:35	7.8	7.4	22	7/26/2016 11:51	7.2	7.5	22
7/26/2016 9:22	8.1	8.2	28	7/26/2016 10:36	7.8	7.2	22	7/26/2016 11:52	7.2	7.2	23
7/26/2016 9:23	8.1	8.3	27	7/26/2016 10:37	7.8	7.6	22	7/26/2016 11:53	7	7.3	22
7/26/2016 9:24	8	8.8	27	7/26/2016 10:38	7.7	7.7	23	7/26/2016 11:54	6.9	7.9	23
7/26/2016 9:25	8	8.3	28	7/26/2016 10:39	7.6	7.5	22	7/26/2016 11:55	6.9	7.6	25
7/26/2016 9:26	8.2	8.2	27	7/26/2016 10:40	7.6	7.2	22	7/26/2016 11:56	7.1	7.4	22
7/26/2016 9:27	8.5	8.7	26	7/26/2016 10:41	7.7	7.6	23	7/26/2016 11:57	7.5	7.5	24
7/26/2016 9:28	8.5	8.6	27	7/26/2016 10:42	7.8	7.9	23	7/26/2016 11:58	7.5	7.8	22
7/26/2016 9:29	8.3	8.5	27	7/26/2016 10:43	7.8	7.6	24	7/26/2016 11:59	7.5	7.6	25
Average	7.978333	7.77	26.23333	Average	7.461667	7.035	15.11667	Average	7.155	7.043333	15.31667
Maximum	8.5	8.8	41	Maximum	7.9	7.9	24	Maximum	7.5	7.9	25
Minimum	7.5	6.7	15	Minimum	7.1	6.5	11	Minimum	6.6	6.4	11

APPENDIX C
Process Data

APCC AIR POLLUTION CHARACTERIZATION AND CONTROL, LTD.

DateTimeStamp	Oxidizer B Cat Temperature 15 Minute Average
07/25/16 11:04 AM	354.10001
07/25/16 11:09 AM	354.21429
07/25/16 11:14 AM	354.34167
07/25/16 11:19 AM	354.29999
07/25/16 11:24 AM	354.39999
07/25/16 11:29 AM	354.37271
07/25/16 11:34 AM	354.39999
07/25/16 11:39 AM	354.41998
07/25/16 11:44 AM	354.35999
07/25/16 11:49 AM	354.35999
07/25/16 11:54 AM	354.34998
07/25/16 11:59 AM	354.36667
07/25/16 12:04 PM	354.40714
07/25/16 12:09 PM	354.43332
07/25/16 12:14 PM	354.45001
07/25/16 12:19 PM	354.43076
07/25/16 12:24 PM	354.60001
07/25/16 12:29 PM	354.5
07/25/16 12:34 PM	354.47501
07/25/16 12:39 PM	354.39999
07/25/16 12:44 PM	354.48334
07/25/16 12:49 PM	354.49091
07/25/16 12:54 PM	354.5
07/25/16 12:59 PM	354.5
07/25/16 01:04 PM	354.48001
07/25/16 01:09 PM	354.48001
07/25/16 01:14 PM	354.42499
07/25/16 01:19 PM	354.4111
07/25/16 01:24 PM	354.39999
07/25/16 01:29 PM	354.39999
07/25/16 01:34 PM	354.41251
07/25/16 01:39 PM	354.39999
07/25/16 01:44 PM	354.45001
07/25/16 01:49 PM	354.45715
07/25/16 01:54 PM	354.43332
07/25/16 01:59 PM	354.20001
07/25/16 02:04 PM	354.31665
07/25/16 02:09 PM	354.35455
07/25/16 02:14 PM	354.5
07/25/16 02:19 PM	354.44
07/25/16 02:24 PM	354.35001
07/25/16 02:29 PM	354.5
07/25/16 02:34 PM	354.5
07/25/16 02:39 PM	354.51999
07/25/16 02:44 PM	354.45334
07/25/16 02:49 PM	354.25
07/25/16 02:54 PM	354.3222
07/25/16 02:59 PM	354.35715
07/25/16 03:04 PM	353.96667
07/25/16 03:09 PM	354.0625
07/25/16 03:14 PM	354.19229
07/25/16 03:19 PM	354.39999
07/25/16 03:24 PM	354.32858
07/25/16 03:29 PM	354.27499
07/25/16 03:34 PM	354.10001
07/25/16 03:39 PM	354.04999
07/25/16 03:44 PM	354.14545
07/25/16 03:49 PM	354.29999
Average	354.3670548

DateTimeStamp	Oxidizer A Cat Temperature 15 Minute Average
07/26/16 08:34 AM	364.25385
07/26/16 08:39 AM	364.29999
07/26/16 08:44 AM	364.32855
07/26/16 08:49 AM	364.28333
07/26/16 08:54 AM	364.29999
07/26/16 08:59 AM	364.18335
07/26/16 09:04 AM	364.20001
07/26/16 09:09 AM	364.10001
07/26/16 09:14 AM	364.08002
07/26/16 09:19 AM	364.10001
07/26/16 09:24 AM	364.08667
07/26/16 09:29 AM	364.125
07/26/16 09:34 AM	364.14444
07/26/16 09:39 AM	364.13571
07/26/16 09:44 AM	364.16669
07/26/16 09:49 AM	364.13751
07/26/16 09:54 AM	364.14615
07/26/16 09:59 AM	363.89999
07/26/16 10:04 AM	363.89999
07/26/16 10:09 AM	363.85834
07/26/16 10:14 AM	364.29999
07/26/16 10:19 AM	364.26666
07/26/16 10:24 AM	364.18182
07/26/16 10:29 AM	364.10001
07/26/16 10:34 AM	364.01999
07/26/16 10:39 AM	364.04999
07/26/16 10:44 AM	364.03333
07/26/16 10:49 AM	364.15002
07/26/16 10:54 AM	364.07779
07/26/16 10:59 AM	364.02856
07/26/16 11:04 AM	363.70001
07/26/16 11:09 AM	363.73749
07/26/16 11:14 AM	363.81537
07/26/16 11:19 AM	364
07/26/16 11:24 AM	363.95715
07/26/16 11:29 AM	363.96667
07/26/16 11:34 AM	364
07/26/16 11:39 AM	364.01666
07/26/16 11:44 AM	363.98181
07/26/16 11:49 AM	363.89999
07/26/16 11:54 AM	364.01666
07/26/16 11:59 AM	363.99091
07/26/16 12:04 PM	363.89999
Average	364.0679179

APPENDIX D
Calibration Data

APCC
CEM CALIBRATION DATA
EPA Method 25A

Project No.:	16020	Date:	25-Jul-16
Plant/Firm:	Baxter Healthcare	Analyzer:	Vig 20/2
Source:	Oxidizer B	Span Value:	300
Location:	Inlet	Analyzer Range:	1000
		Cal Gas:	methane

PRE-TEST Calibration And Linearity:

	Zero	Low Range	Mid Range	High Range	
Cal Gas Cyl. Value:	0.0	85.7	175.0	290.8	
Cal Response:	0.0	89	178	291	
Slope:		1.0007	1.0007	1.0007	
Predicted Response:		85.8	175.1		
Cal Error (<5%):		3.8%	1.6%		

Calibration Drift Check:

Run 1

	Pre Cal	Post Cal	
Gas Conc.	Calibration response	Calibration response	Drift (<3%)
0	0	5.0	1.7
85.7	89	91.7	0.9

Run 2

	Pre Cal	Post Cal	
Gas Conc.	Calibration response	Calibration response	Drift (<3%)
0	5.0	5.8	0.3
85.7	91.7	97	1.8

Run 3

	Pre Cal	Post Cal	
Gas Conc.	Calibration response	Calibration response	Drift (<3%)
0	5.8	5.6	0.1
85.7	97	100	1.0

Slope, M: $$M = \frac{Cma - Co}{Cm}$$

Cma = Span Cal Gas Cyl. Value
Cm = Calibration response
Co = Zero response

Predicted Response, PR:

$$PR = M * Cma + Co$$

Calibration Error Calculation, Cerr:

$$Cerr = \frac{Cm - Pr}{Cma} \times 100$$

Calibration Drift Calculation, Cd:

$$Cd = \frac{\text{Pre Cal Response - Post Cal Response}}{\text{Span}}$$

APCC AIR POLLUTION CHARACTERIZATION AND CONTROL, LTD.

APCC
CEM CALIBRATION DATA
EPA Method 25A

Project No.:	16020	Date:	25-Jul-16
Plant/Firm:	Baxter Healthcare	Analyzer:	Vig 200
Source ID:	Oxidizer B	Span Value:	60
Location:	Outlet	Analyzer Range:	100
		Cal Gas:	methane

PRE-TEST Calibration And Linearity:

	Zero	Low Range	Mid Range	High Range	
Cal Gas Cyl. Value:	0.0	19.2	31.1	56.8	
Cal Response:	0.0	19.1	31.8	56.7	
Slope:		0.9982	0.9982	0.9982	
Predicted Response:		19.2	31.0		
Cal Error (<5%):		-0.3%	2.4%		

Calibration Drift Check:

Run 1

	Pre Cal	Post Cal	
Gas Conc.	Calibration response	Calibration response	Drift (<3%)
0	0	0.0	0.0
19.2	19.1	18.5	1.0

Run 2

	Pre Cal	Post Cal	
Gas Conc.	Calibration response	Calibration response	Drift (<3%)
0	0.0	0.2	0.3
19.2	18.5	18.3	0.3

Run 3

	Pre Cal	Post Cal	
Gas Conc.	Calibration response	Calibration response	Drift (<3%)
0	0.2	0.1	0.2
19.2	18.3	18.8	0.8

Slope, M: $$M = \frac{Cma - Co}{Cm}$$

Cma = Span Cal Gas Cyl. Value
Cm = Calibration response
Co = Zero response

Predicted Response, PR:

$$PR = M * Cma + Co$$

Calibration Error Calculation, Cerr:

$$Cerr = \frac{Cm - Pr}{Cma} \times 100$$

Calibration Drift Calculation, Cd:

$$Cd = \frac{\text{Pre Cal Response - Post Cal Response}}{\text{Span}}$$

APCC
CEM CALIBRATION DATA
EPA Method 25A

Project No.:	16020	Date:	25-Jul-16
Plant/Firm:	Baxter Healthcare	Analyzer:	Vig 200
Source ID:	Oxidizer B	Span Value:	35
Location:	Outlet	Analyzer Range:	100
		Cal Gas:	methane/propane

PRE-TEST Calibration And Linearity:

	Zero	Low Range	Mid Range	High Range
Cal Gas Cyl. Value:	0.0	9.3	15.2	30.1
Cal Response:	0.0	9.3	15.1	29.8
Slope:		0.9900	0.9900	0.9900
Predicted Response:		9.2	15.0	
Cal Error (<5%):		1.0%	0.3%	

Calibration Drift Check

Final

	Pre Cal	Post Cal	
Gas Conc.	Calibration response	Calibration response	Drift (<3%)
0	0	-0.1	0.3
9.3	9.3	9.5	0.6

Slope, M:

$$M = \frac{Cma - Co}{Cm}$$

Cma = Span Cal Gas Cyl. Value
Cm = Calibration response
Co = Zero response

Predicted Response, PR:

$$PR = M * Cma + Co$$

Calibration Error Calculation, Cerr:

$$Cerr = \frac{Cm - Pr}{Cma} \times 100$$

APCC AIR POLLUTION CHARACTERIZATION AND CONTROL, LTD.

APCC
CEM CALIBRATION DATA
EPA Method 25A

Project No.:	16020	Date:	26-Jul-16
Plant/Firm:	Baxter Healthcare	Analyzer:	Vig 20/2
Source:	Oxidizer A	Span Value:	300
Location:	Inlet	Analyzer Range:	1000
		Cal Gas:	methane

PRE-TEST Calibration And Linearity:

	Zero	Low Range	Mid Range	High Range	
Cal Gas Cyl. Value:	0.0	85.7	175.0	290.8	
Cal Response:	0.0	85.8	177	290	
Slope:		0.9972	0.9972	0.9972	
Predicted Response:		85.5	174.5		
Cal Error (<5%):		0.4%	1.4%		

Calibration Drift Check:

Run 1

	Pre Cal	Post Cal	
Gas Conc.	Calibration response	Calibration response	Drift (<3%)
0	0	5.0	1.7
85.7	85.8	88.8	1.0

Run 2

	Pre Cal	Post Cal	
Gas Conc.	Calibration response	Calibration response	Drift (<3%)
0	5.0	4.0	0.3
85.7	88.8	87.4	0.5

Run 3

	Pre Cal	Post Cal	
Gas Conc.	Calibration response	Calibration response	Drift (<3%)
0	4	5.0	0.3
85.7	87.4		29.1

Emissions Averages:

	Run 1	Run 2	Run 3	Average	
Analyzer Average:				#DIV/0!	(C)

Slope, M: $M = \frac{Cma - Co}{Cm}$

Cma = Span Cal Gas Cyl. Value
Cm = Calibration response
Co = Zero response

Predicted Response, PR:

$$PR = M * Cma + Co$$

Calibration Error Calculation, Cerr:

$$Cerr = \frac{Cm - Pr}{Cma} \times 100$$

Calibration Drift Calculation, Cd:

$$Cd = \frac{\text{Pre Cal Response - Post Cal Response}}{\text{Span}}$$

APCC
CEM CALIBRATION DATA
EPA Method 25A

Project No.:	16020	Date:	26-Jul-16
Plant/Firm:	Baxter Healthcare	Analyzer:	Vig 200
Source ID:	Oxidizer A	Span Value:	60
Location:	Outlet	Analyzer Range:	100
		Cal Gas:	methane

PRE-TEST Calibration And Linearity:

	Zero	Low Range	Mid Range	High Range
Cal Gas Cyl. Value:	0.0	19.2	31.1	56.8
Cal Response:	0.0	19.1	31.2	56.8
Slope:		1.0000	1.0000	1.0000
Predicted Response:		19.2	31.1	
Cal Error (<5%):		-0.5%	0.3%	

Calibration Drift Check:

Run 1

	Pre Cal	Post Cal	
Gas Conc.	Calibration response	Calibration response	Drift (<3%)
0	0	0.0	0.0
19.2	19.1	19.3	0.3

Run 2

	Pre Cal	Post Cal	
Gas Conc.	Calibration response	Calibration response	Drift (<3%)
0	0.0	0.0	0.0
19.2	19.3	19	0.5

Run 3

	Pre Cal	Post Cal	
Gas Conc.	Calibration response	Calibration response	Drift (<3%)
0	0	0.0	0.0
19.2	19	19.3	0.5

Emissions Averages:	Run 1	Run 2	Run 3	Average	
Analyzer Average:				#DIV/0!	(C)

Slope, M: $M = \frac{Cma - Co}{Cm}$

Cma = Span Cal Gas Cyl. Value
Cm = Calibration response
Co = Zero response

Predicted Response, PR:

$PR = M * Cma + Co$

Calibration Error Calculation, Cerr:

$Cerr = \frac{Cm - Pr}{Cma} \times 100$

Calibration Drift Calculation, Cd:

$Cd = \frac{\text{Pre Cal Response - Post Cal Response}}{\text{Span}}$

APCC AIR POLLUTION CHARACTERIZATION AND CONTROL, LTD.

APCC
CEM CALIBRATION DATA
EPA Method 25A

Project No.:	16020	Date:	26-Jul-16
Plant/Firm:	Baxter Healthcare	Analyzer:	Vig 200
Source ID:	Oxidizer A	Span Value:	35
Location:	Outlet	Analyzer Range:	100
		Cal Gas:	methane/propane

PRE-TEST Calibration And Linearity:

	Zero	Low Range	Mid Range	High Range	
Cal Gas Cyl. Value:	0.0	9.3	15.2	30.1	
Cal Response:	0.2	9.4	15.6	30.6	
Slope:		1.0100	1.0100	1.0100	
Predicted Response:		9.6	15.6		
Cal Error (<5%):		-2.1%	0.3%		

Calibration Drift Check

Run 1

	Pre Cal	Post Cal	
Gas Conc.	Calibration response	Calibration response	Drift (<3%)
0	0.2	0.0	0.6
9.3	9.4	9	1.1

Slope, M: $M = \frac{Cma - Co}{Cm}$

Cma = Span Cal Gas Cyl. Value
Cm = Calibration response
Co = Zero response

Predicted Response, PR:

$$PR = M * Cma + Co$$

Calibration Error Calculation, Cerr:

$$Cerr = \frac{Cm - Pr}{Cma} \times 100$$